

Advant[®] OCS
with Master software

RCOM
Advant[®] Controller 110

User's Guide



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TABLE OF CONTENTS

Chapter 1 - Introduction

1.1	General Information.....	1-1
1.2	Manual Organization	1-3
1.3	Conventions	1-4
1.4	Related Documentation.....	1-5
1.5	Release History	1-6
1.6	Terminology.....	1-7
1.7	Possibilities of RCOM Realization.....	1-8
1.8	Equipment Requirements.....	1-8
1.8.1	RCOM using MVI	1-8
1.8.2	RCOM using SW Driver.....	1-9
1.8.3	Modems and cables.....	1-9
1.8.4	Engineering tools	1-9
1.9	Product Overview	1-10
1.9.1	RCOM using MVI	1-10
1.9.2	RCOM using SW Driver.....	1-15
1.9.3	Functionality	1-22
1.9.3.1	Functional Overview	1-23
1.9.4	Data Flow.....	1-24
1.9.4.1	Initiating a Connection	1-24
1.9.4.2	Data Transfer and Commands.....	1-24
1.9.4.3	Flow Control	1-27
1.9.4.4	MP 40 Data Flow	1-28
1.9.4.5	Transfer of time-tagged Events.....	1-28

Chapter 2 - Installation

2.1	Site Planning Environment	2-1
2.2	RCOM using MVI	2-1
2.2.1	Setup	2-1
2.2.2	Start-up Procedures.....	2-3
2.2.3	Product Verification.....	2-4
2.3	RCOM using SW Driver.....	2-4
2.3.1	Setup	2-4
2.3.2	Start-up Procedures.....	2-6
2.3.3	Product Verification.....	2-7
2.4	Modems and Cables.....	2-8

CONTENTS (continued)

Chapter 3 - Configuration/Application Building

3.1	Design considerations	3-1
3.2	Capacity	3-2
3.3	Total Load on RCOM Link	3-2
3.3.1	Transmission Time of MVB Elements	3-3
3.3.2	Load Caused by MVB Elements	3-4
3.3.3	Load Caused by Time-Tagged Events	3-7
3.3.4	Load Caused by Clock Synchronization	3-7
3.4	CPU Load From MVI Data Block Communication	3-9
3.4.1	RCOM using MVI	3-9
3.4.2	RCOM using SW Driver	3-10
3.5	Application Start-up	3-11
3.6	Tutorial	3-12
3.6.1	Application in Master Node	3-13
3.6.1.1	DB Elements in the Master Node	3-13
3.6.1.2	The PC Program in the Master Node	3-17
3.6.2	Application in Slave Node	3-18
3.6.2.1	DB Elements in the Slave Node	3-18
3.6.2.2	PC Program in the Slave Node	3-20
3.7	Application Procedures	3-21
3.7.1	Master Functions	3-24
3.7.2	Slave Functions	3-24
3.8	Configuration of RCOM Application DB Elements and PC Program	3-25
3.8.1	DB Elements for Configuration of RCOM using MVI	3-25
3.8.1.1	DB Elements for MVI Module Configuration SC610, CI532	3-26
3.8.2	DB Elements for Configuration of RCOM using SW Driver	3-29
3.8.3	DB Element for MVI Channel Characteristics MVICHAN	3-30
3.8.4	DB Element for Node Configuration and Status MVINODE	3-38
3.8.5	DB Element for Data Transfer and Command MVB	3-47
3.8.6	DB Element MVB for Data Transfer	3-52
3.8.6.1	Data Transfer from Master to Slave	3-54
3.8.6.2	Data Transfer from Slave to Master	3-56
3.8.7	DB Element MVB for Commands	3-59
3.8.7.1	Cold Start a Slave	3-61
3.8.7.2	Warm Start/Block a Slave	3-63
3.8.7.3	Normalize/Deblock a Slave	3-65
3.8.7.4	Clock Synchronization	3-67
3.8.7.5	Telephone Commands	3-68

CONTENTS (continued)

3.8.8	PC Program Layout	3-72
3.8.8.1	RCOM Data Flow Control Type Circuits	3-73
3.8.8.2	RCOM Data Flow Control	3-77
3.8.8.3	Transmission of Time-Tagged Events from Event Sets	3-78
3.8.9	Configuration with MasterPiece 40	3-81
3.8.9.1	Application in Master Node AC110	3-82
3.8.9.2	Parameters on the Slave Node (MP 40)	3-89

Chapter 4 - Runtime Operation

4.1	Product Operation	4-1
4.2	Operating Overview	4-1
4.3	Runtime Tutorial	4-1
4.4	Operating Instructions	4-1
4.5	Runtime Operating Menus	4-1

Chapter 5 - Maintenance

5.1	Hardware Indicators	5-1
5.2	Software Indicators	5-1
5.3	Module Diagnosis	5-3
5.4	Fault Finding and User Repair	5-3

INDEX

Chapter 1 Introduction

1.1 General Information

This manual describes the asynchronous communication protocol RCOM (Remote COMmunication) in the Advant Controller 110 (AC 110). RCOM provides remote communication capabilities, using multidrop, point-to-point or dial-up connections, e.g. over public telephone networks.

RCOM is available in two versions:

- RCOM the basic transmission concept
- RCOM Extended has a safer CRC checksum calculation, allows sending of larger data packages and do not use BREAK character in the message

The transmission speed for all versions of RCOM is up to 19200 bits/s.

MasterPiece 200/1 (MP 200/1) and Advant Controller 400 Series (AC 400) are the possible RCOM master stations with AC 110 acting as a slave (see Figure 1-1)

AC 110 and MasterPiece 40 are the possible RCOM slave stations with AC 110 acting as a master in a master-slave communication relationship (see Figure 1-2)

If AC 110 is directly connected to an AC 400 Series station via RCOM as shown in Figure 1-1, it is possible to perform engineering station functions remotely on the AC 110 using a matching Advant Engineering Station connected to the AC 400 Series station. AC 400 version ≥ 1.3 and AC 110 version ≥ 2.1 are required.

AC 110 with version ≥ 2.1 is a possible partner of AdvaSoft for Windows which from its version ≥ 1.3 is able to communicate via RCOM.

Traffic on the RCOM link is controlled by a master station. Direct communication is possible only between the master and the slaves. Stations connected via RCOM appear in the Advant OCS system as nodes in a MasterNet local control network.

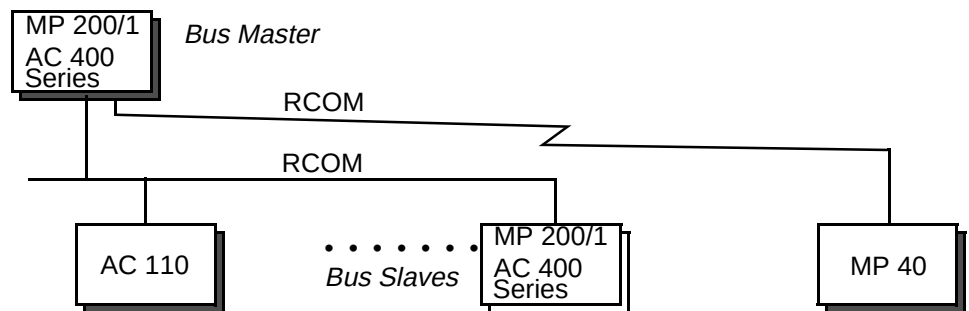


Figure 1-1. Example of an RCOM configuration, AC 110 as RCOM slave.

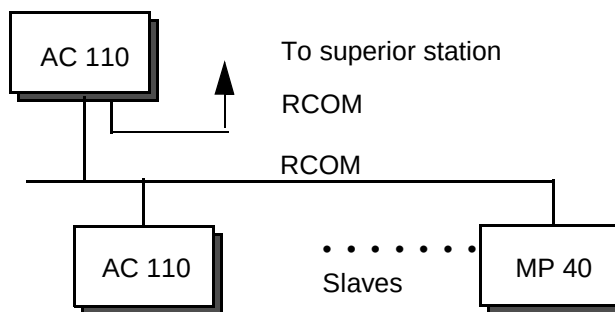


Figure 1-2. Example of an RCOM configuration, AC 110 as RCOM master and slave.

For the RCOM protocol (RCOM or RCOM Extended) in Advant Controller 110 the CI532V01 asynchronous communication submodule is needed with a SC610 carrier module and a special RCOM option system software (OPT2)

The purpose of this manual is to describe how to configure and use the RCOM communication from the application programs, i.e. the process DB elements and the AMPL-programs (ABB MasterPiece Language), in the AC 110.

For AC 400 please refer to the manual RCOM - Advant Controller 400 User's Guide.

For MP 40 please refer to the manual RCOM MasterPiece 40 User's Manual.

The manual is mainly intended to be used by an ABB Master application programmer. The manual is also useful for a commissioning and service engineer. The reader must be familiar with application building in the AC 110.

1.2 Manual Organization

Figure 1-3 shows the basic structure of the Advant System's various documentations. Each document, describing hardware or software, is built around this one structure. The intent of one structure is to make it possible for you to easily locate related information in any of the documents.

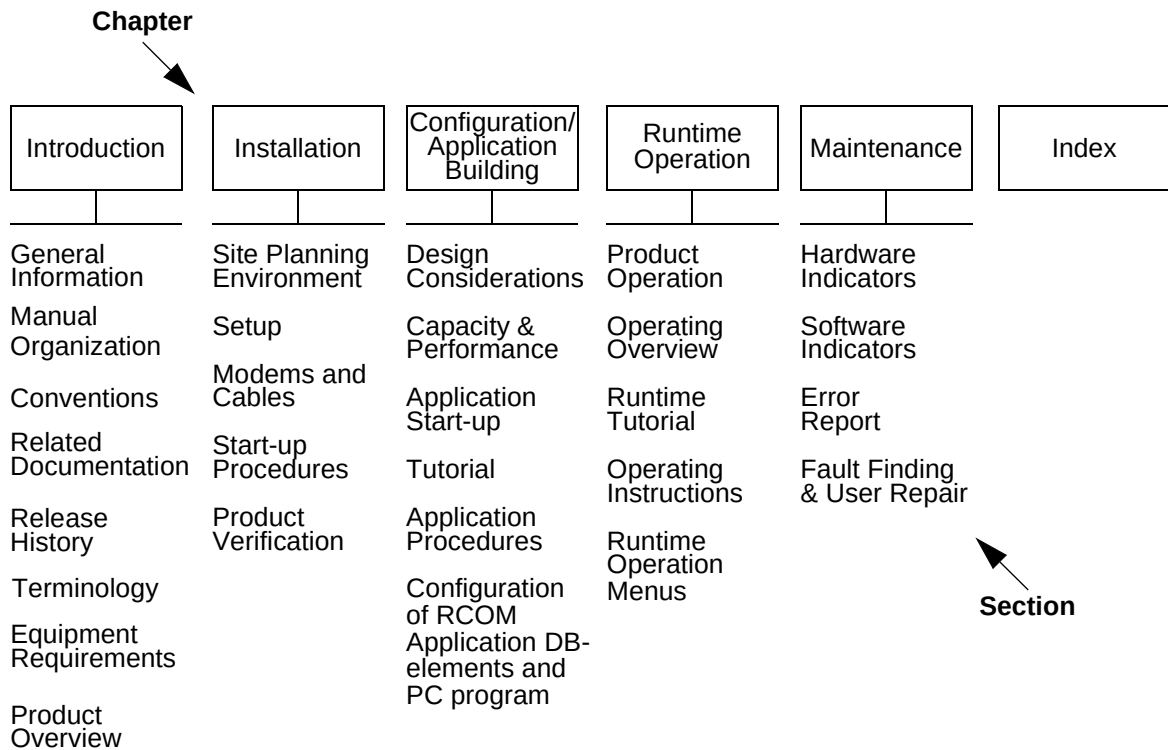


Figure 1-3. Manual organization diagram

Introduction

In Chapter 1, Introduction (this chapter), you will find a description of the RCOM functions in Advant Controller 110, system layout, hardware requirements, related documents, release history, terminology and this manual's organization.

Installation

Chapter 2, Installation, tells you how to setup the RCOM communication hardware in the AC 110. You will also find a description of the shut-down and start-up procedure and how to verify correct operation after power up.

Configuration and Application Building

Chapter 3, Configuration/Application Building, describes the programming of the process data base. How to define commands for data exchange and how to store data. The chapter also describes how to build the PC program for flow control on the communication link. You will find capacity and performance figures for the communication and an example of an application program. The configuration of line characteristics and network configuration is described. Different set-up for RCOM and RCOM Extended are shown.

Runtime operation

In Chapter 4, Runtime Operation, you will find information of how to check the link status and how to activate the application for transmission of commands and data.

Maintenance

Chapter 5, Maintenance, gives a translation of error report concerning RCOM. The chapter also describes a fault finding procedure.

1.3 Conventions

All input values to data base elements that requires user input is **boldfaced**.

1.4 Related Documentation

Refer to the following documents for further information about application building and RCOM functionality

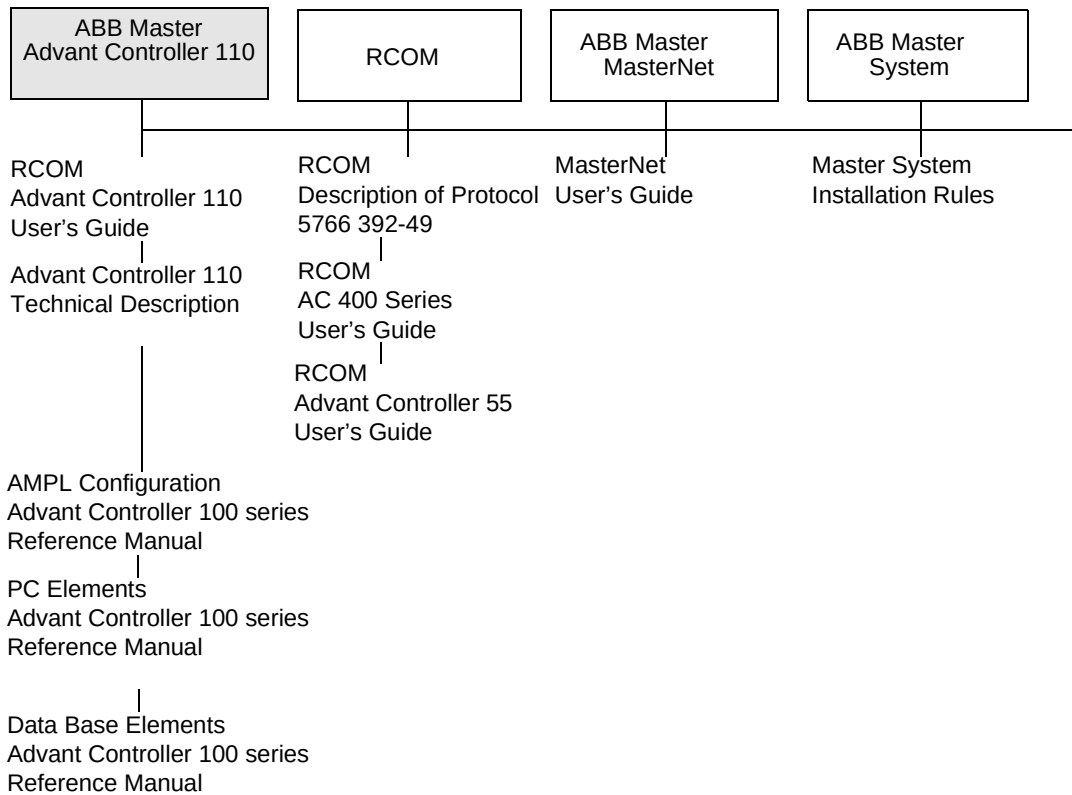


Figure 1-4. RCOM and related documentation tree

1.5 Release History

Table 1-1. AC 110 RCOM release history

Version	Description
1.0	CI 532 V01, Multi Vendor Interface for RCOM. First release.
2.0	Advant Controller 110 OPT2 SW MVI Option software. First release
2.0	Advant Controller 110 OPT3 SW(optional) Event Option software. First release
2.1	Advant Controller 110 OPT2 SW MVI Option software.
2.1	Advant Controller 110 OPT3 SW(optional) Event Option software.
2.1	Advant Controller 110 OPT5: RCOM Driver RCOM on channel 2 of PM632/PM633. First release

See chapter 16 in the manual
AMPL Configuration Advant Controller 100 Series, User's Guide

1.6 Terminology

The following conventions and abbreviations are used throughout this document.

- **AC** is an abbreviation for the ABB Advant Controller Family.
- **AC 110** is the abbreviation for Advant Controller 110.
- **AMPL** is an abbreviation for the ABB Master Programming Language. AMPL is used for application programming in AC 110.
- **Command MVB** is a MVB DB element defining the command used for control of slaves. The Command MVB's are only defined in RCOM master mode, except the telephone commands that can be used in RCOM slave mode.
- **DAT** is a concept of the DB-elements that holds a data value (1 Real-, 1 Integer- or 32 Boolean values). The data values of MVB's are hold by referenced DAT-elements.
- **Data MVB** is the MVB DB element used for data transfer. It is used for transfer of block of data in an ABB Advant network.
In RCOM a Data MVB is a collection of up to 8 or 24 DAT's depending on the RCOM protocol type.
- **DB elements** are used for configuring the AC 110.
- **EVS (EVent Set)** DB elements are used for configuring the flow of events.
- **MS** is an abbreviation for the Multi Vendor Data Set, used in other RCOM implementations. The concept of data transfer and commands is similar to the MVB concept.
- **MVB** is an abbreviation for the MVI Data Block. MVB is a special type of Data Sets used for data transfer and commands in RCOM.
- **MVI** is an abbreviation for the ABB Advant Controller Multi Vendor Interface CI532V01.
- **RCOM** is an abbreviation for Remote COMunication in the Advant Controller family.
- **RCOM SW Driver** means an RCOM channel on the AC 110 processor modules' CH2 serial interface.
- **RCOM Extended** is an RCOM protocol type with 24 DAT's, saver CRC check, no 'Break'.
- **PC program** (Process Control program) is a program written in AMPL.
- **PS** refers to ABB Advant Controller Process Station
- **RTU** is an abbreviation for Remote Terminal Unit

1.7 Possibilities of RCOM Realization

There are two principle possibilities to prepare for RCOM in the AC 110 system:

- Use of Multi Vendor Interface CI532 V01 and AC 110 OPT2 SW:
This solution must be chosen if more than one RCOM channel is required or if the second serial interface of the processor module is used for a local MMI connection using AC 110 OPT4 SW. Since the CI532 V01 has its own microprocessor to control RCOM the processor module is not really involved with the handling of RCOM telegrams. CI532 V01 needs a submodule carrier SC610 to be put in.
If the following chapters describe details of this solution the term “MVI” is used.
- Use of RCOM SW driver on CH2 of the processor modules using AC 110 OPT5 SW
This is possible if only one RCOM channel is required and if CH2 is not used for a local MMI connection.
This solution is inexpensive since no additional hardware is needed for RCOM. RCOM is controlled by the microprocessor of the processor module itself. Depending on the communication speed up to 1/3 of the processor’s capacity is required to control RCOM. If the following chapters describe details of this solution the term “SW driver” is used.

1.8 Equipment Requirements

1.8.1 RCOM using MVI

Basic equipment requirement for RCOM in Advant Controller110 are:

Communication hardware in the AC 110

- CI532V01
Communication submodule for connection of 2 RCOM links.
- A free submodule position for the CI532V01 on the following submodule carrier:
 - SC610
Carrier with two subpositions for the CI532V01

Communication software in the AC 110

- Advant Controller 110 OPT2 SW *2.1
MVI Option software.
- Advant Controller 110 OPT3 SW *2.1
Event-Option software.
- Advant Controller 110 Base SW *2.1
AC 110 Base system software.

1.8.2 RCOM using SW Driver

Communication software in the AC 110

- Advant Controller 110 OPT5 SW *2.1
RCOM Driver Option software.
- Advant Controller 110 Base SW *2.1
AC 110 Base system software.

1.8.3 Modems and cables

The modems and cables recommended are listed in the manual
RCOM - Advant Controller 400 series User's Guide .
General description see Chapter 2.3.

1.8.4 Engineering tools

To build the data base and the PC program in the Advant Controller 110 Series you need the
Advant Station 100 Series Engineering Station.

1.9 Product Overview

1.9.1 RCOM using MVI

RCOM using MVI in an Advant Controller 110 consists of three parts:

- The **PC program** (Process Control program) written in ABB Master Program Language (AMPL) is used to define and **control** the flow of data and commands on the link. In slave mode a PC program for data flow control is optional.
- **The Data Base (DB) elements** are used to **configure** the CI532V01 submodule with its carrier SC610 and the RCOM Link with the remote nodes and to configure the data and command flow
- Communication submodule **CI532V01** which runs the **RCOM** protocol

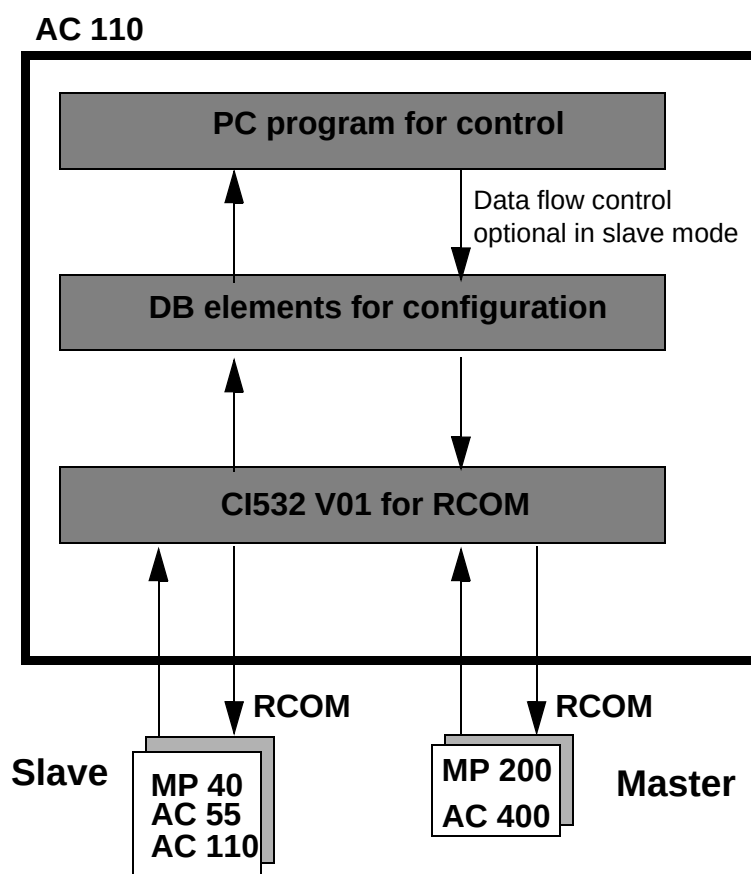


Figure 1-5. Overview of RCOM using MVI in Advant Controller 110

Each channel forms a local control network within the Advant OCS system with the network numbers 1-9. In master mode CI532V01 can handle up to 25 slaves (nodes) per channel. Since every node on the RCOM link is a part of the local control network, each node must have a unique node number (1-254) within the control network concerned.

An example with MasterPiece 200/1 please see Figure 1-6.

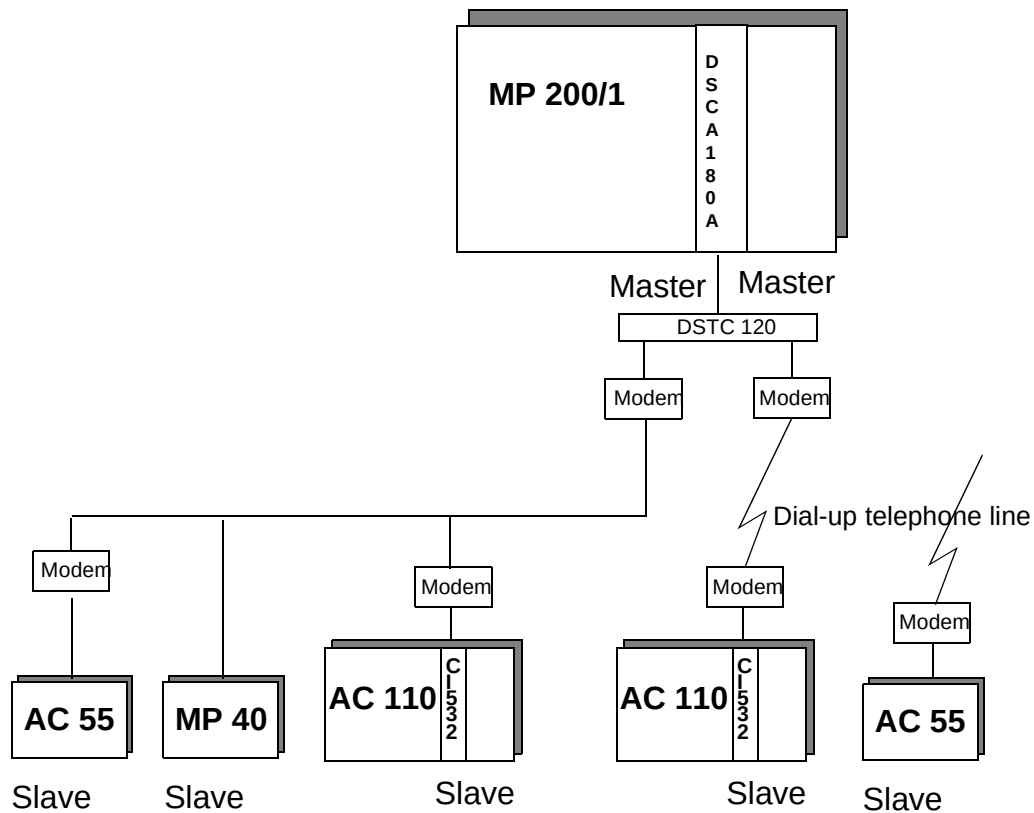


Figure 1-6. Configuration example with MasterPiece 200/1

In MP 200/1 the DSCA180A is used as Multi-Vendor-Interface for RCOM with the DSTC120 connector unit. The DSCA180A provides 2 RCOM channels. Up to 9 RCOM channels are possible using additional DSCA180A modules.

For MasterPiece 200/1 and Advant Controller 400 Series, please refer to the related documentation
An example with the Advant Controller 400 Series see Figure 1-7.

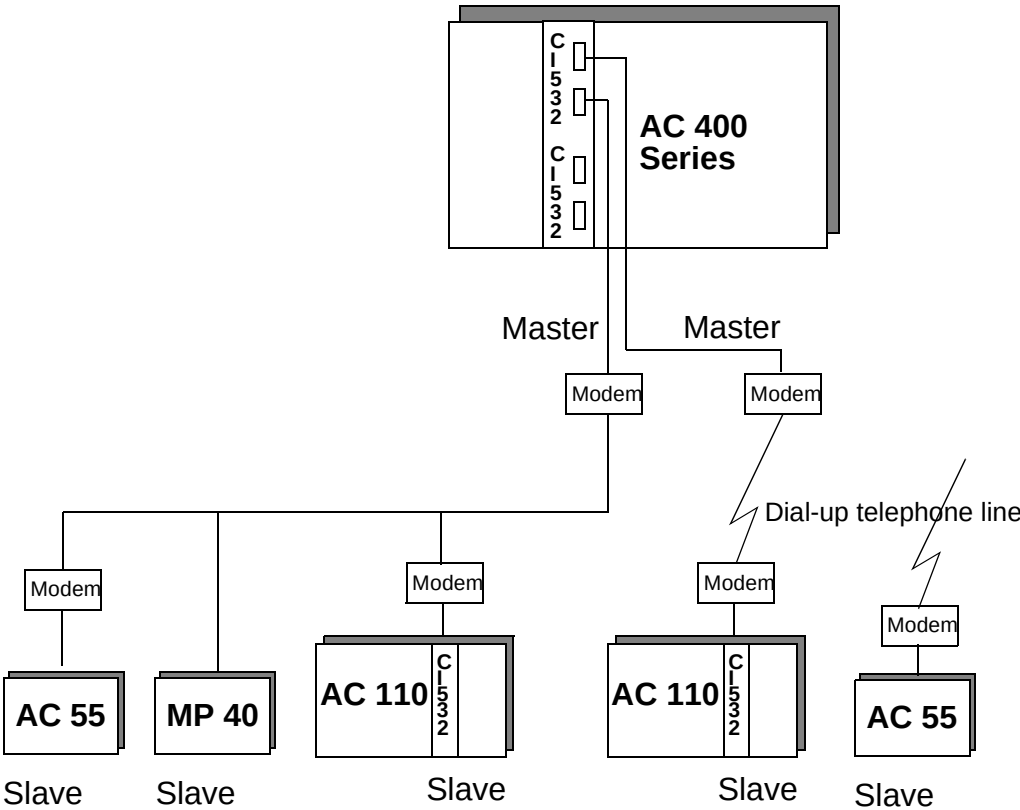


Figure 1-7. Configuration example with Advant Controller 400 series

An example with the Advant Controller 110 as master see Figure 1-8.

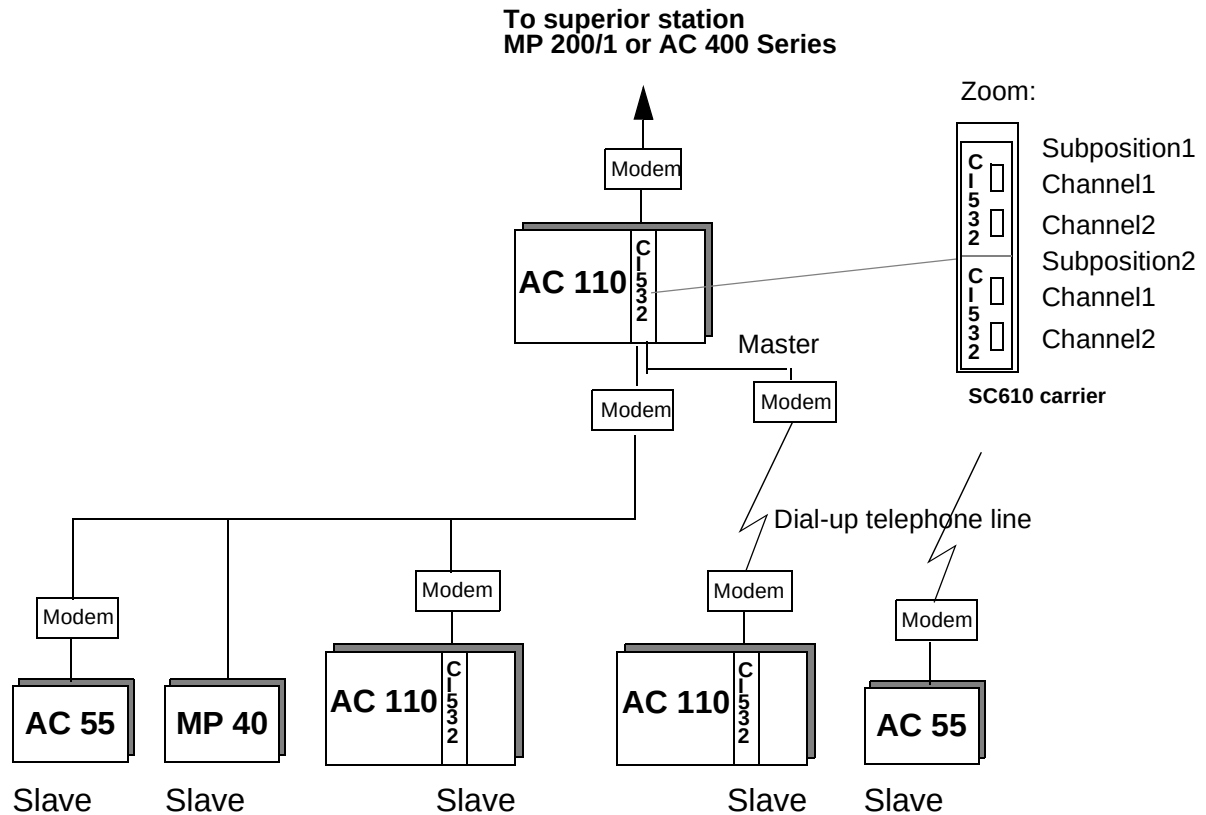


Figure 1-8. Configuration example with Advant Controller 110 as master

Advant Controller 110 with RCOM Option is needs a CI532V01 RCOM submodule.

CI532V01 is a submodule which needs the carrier SC610 to be installed in an AC 110 rack. The CI532V01 submodule is plugged onto a SC610 carrier module which is able to carry 2 submodules CI532. See *Advant Controller 110 Technical Description*.

CI532V01 is equipped with two independent, asynchronous communication channels for RCOM communication. The channels can be configured either as master or slave on the RCOM link. The setup of each channel is defined by special DB elements (see Section 2.2.2, Start-up Procedures).

AC 110

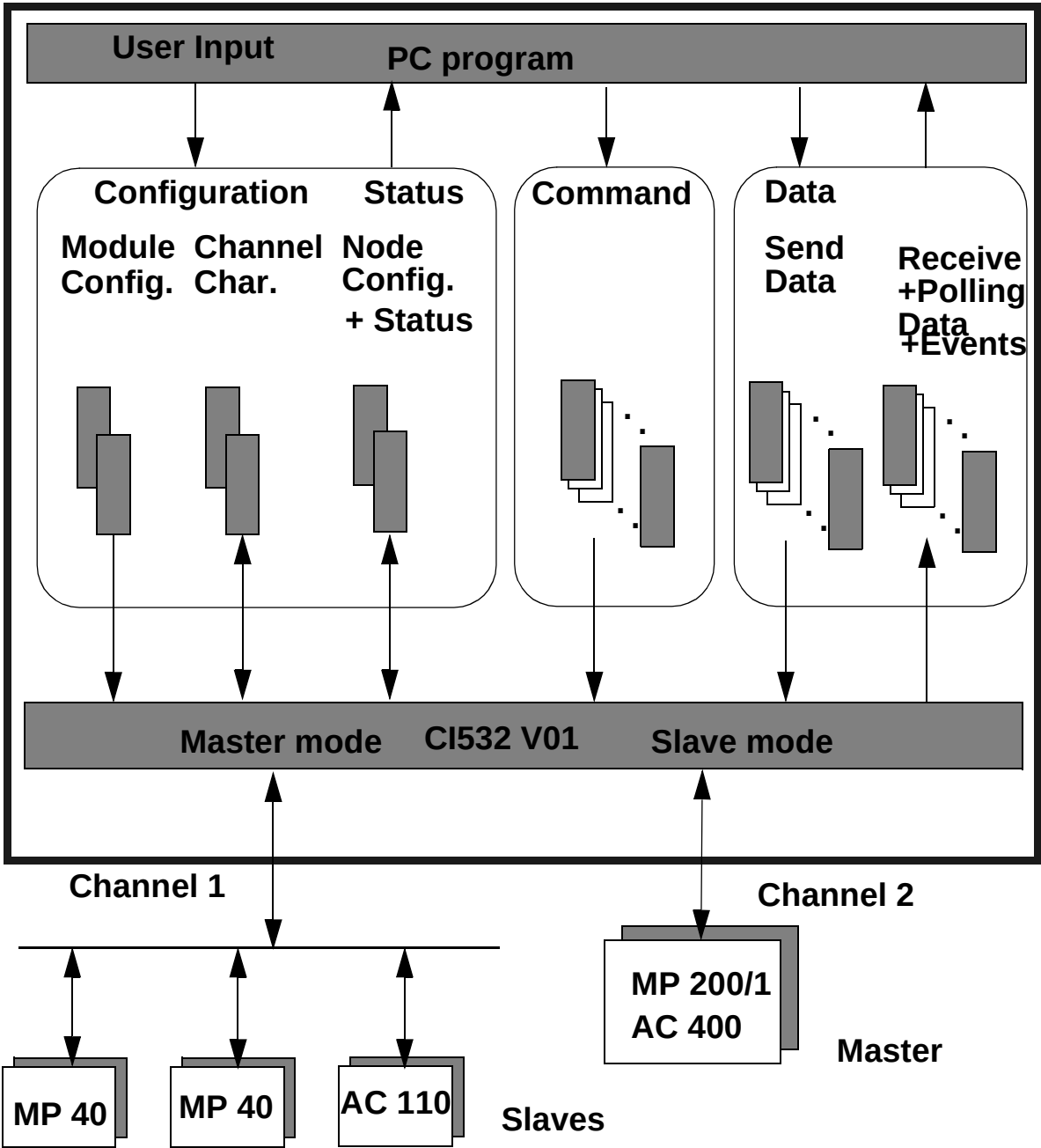


Figure 1-9. Functional overview in the Advant Controller 110 for RCOM networks using MVI.

1.9.2 RCOM using SW Driver

RCOM using SW driver in Advant Controller 110 consists of 3 parts:

- The **PC program** (Process Control program) written in ABB Master Program Language (AMPL) is used to define and **control** the flow of data and commands on the link. In slave mode a PC program for data flow control is optional.
- The **Data Base (DB) elements** are used to **configure** the RCOM Link with the remote nodes and to configure the data and command flow
- CH2 interface of the processor module which runs the **RCOM** protocol

AC 110

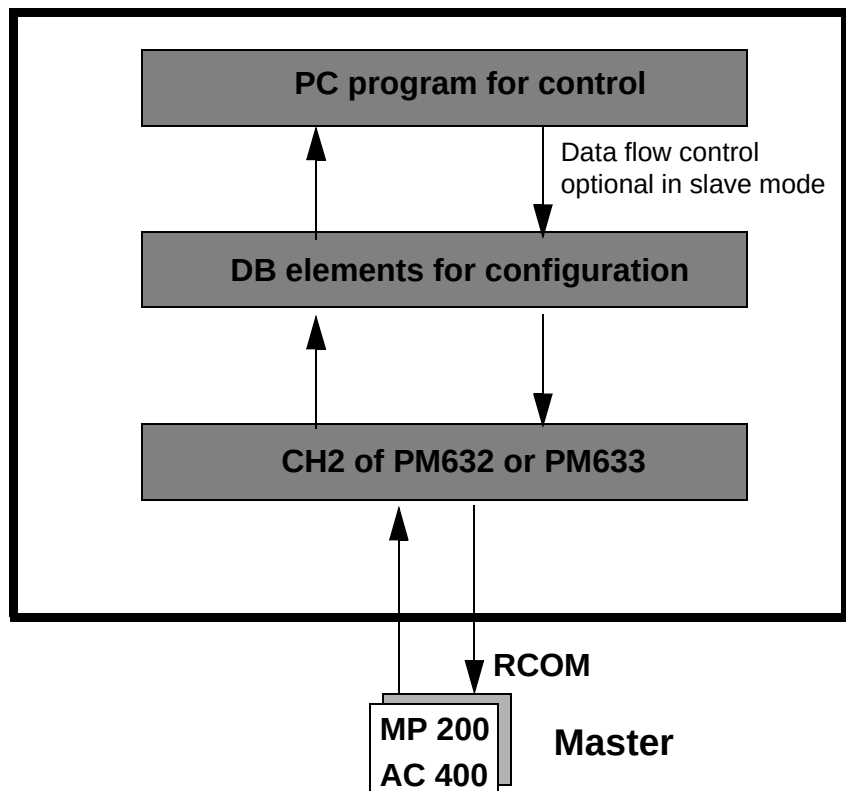


Figure 1-10. Overview of RCOM using SW driver in Advant Controller 110

AC 110

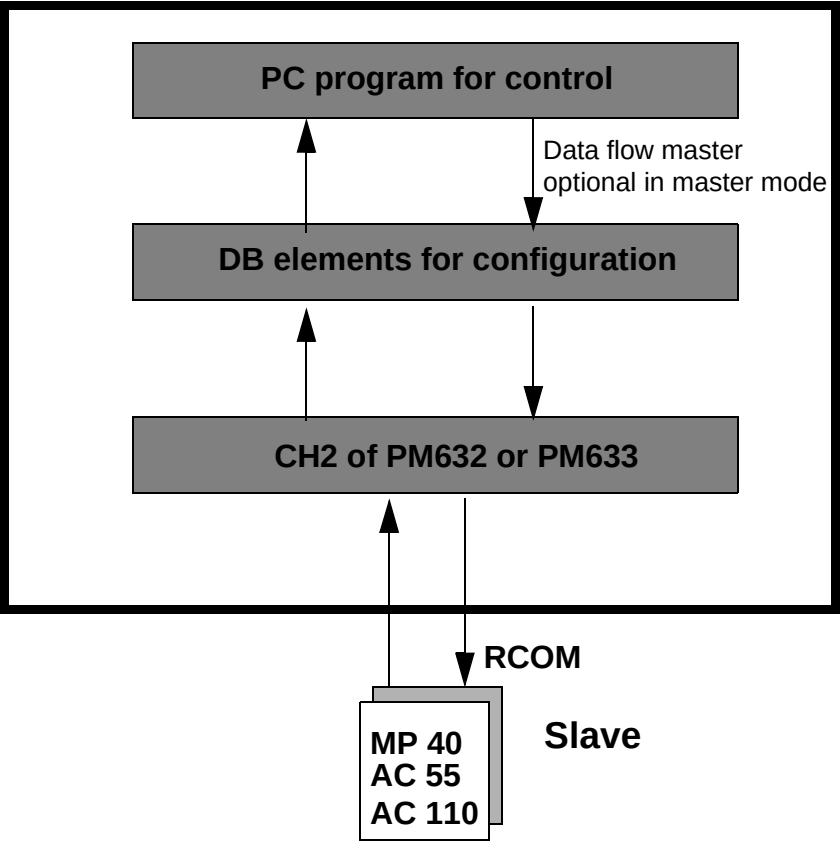


Figure 1-11. Overview of RCOM using SW driver in Advant Controller 110

The channel forms a local control network within the Advant OCS system with the network numbers 1-9. In master mode the RCOM channel can handle up to 25 slaves (nodes). Since every node on the RCOM link is a part of the local control network, each node must have a unique node number (1-254) within the control network concerned.
An example with MasterPiece 200/1 please see below.

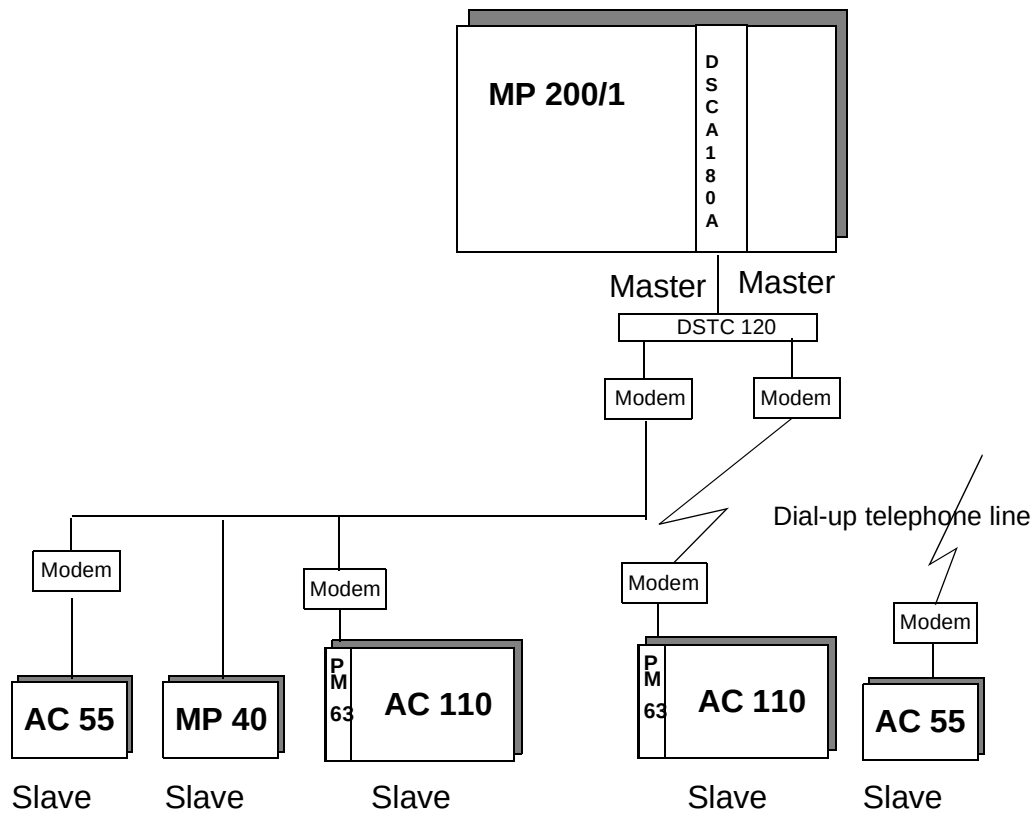


Figure 1-12. Configuration example with MasterPiece 200/1

In MP 200/1 the DSCA180A is used as Multi-Vendor-Interface for RCOM with the DSTC120 connector unit. The DSCA180A provides 2 RCOM channels. Up to 9 RCOM channels are possible using additional DSCA180A modules.

For MasterPiece 200/1 and Advant Controller 400 Series, please refer to the related documentation
An example with the Advant Controller 400 Series see Figure 1-13.

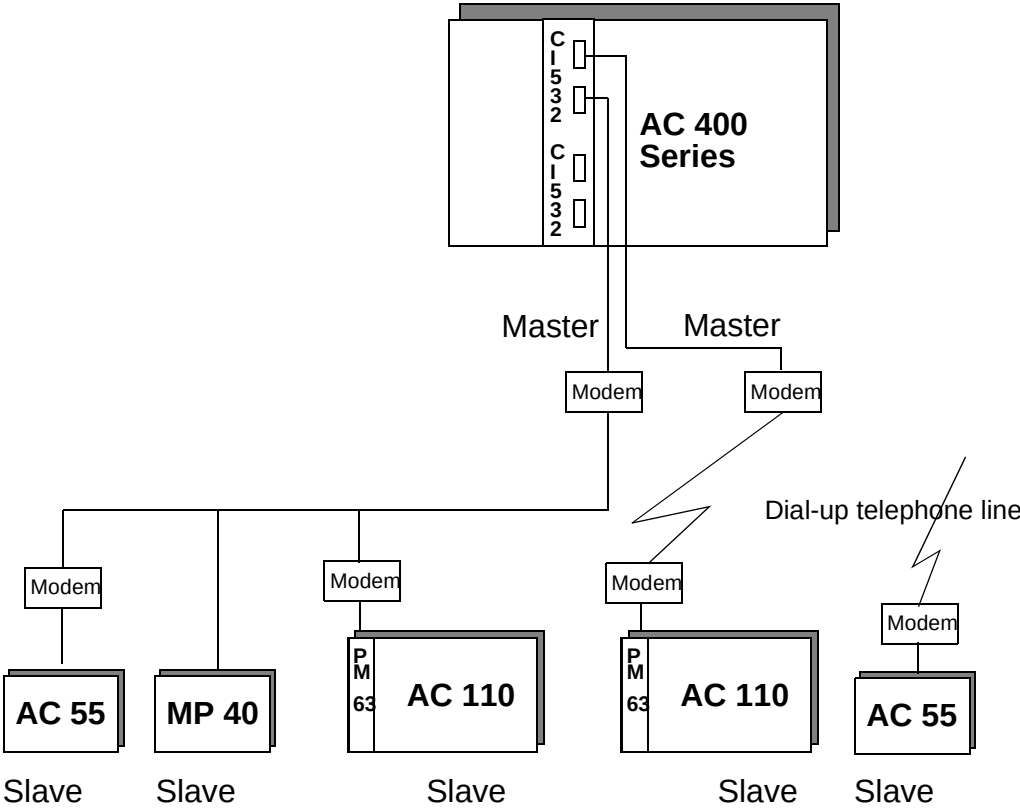


Figure 1-13. Configuration example with Advant Controller 400 series

An example with the Advant Controller 110 as master see Figure 1-14

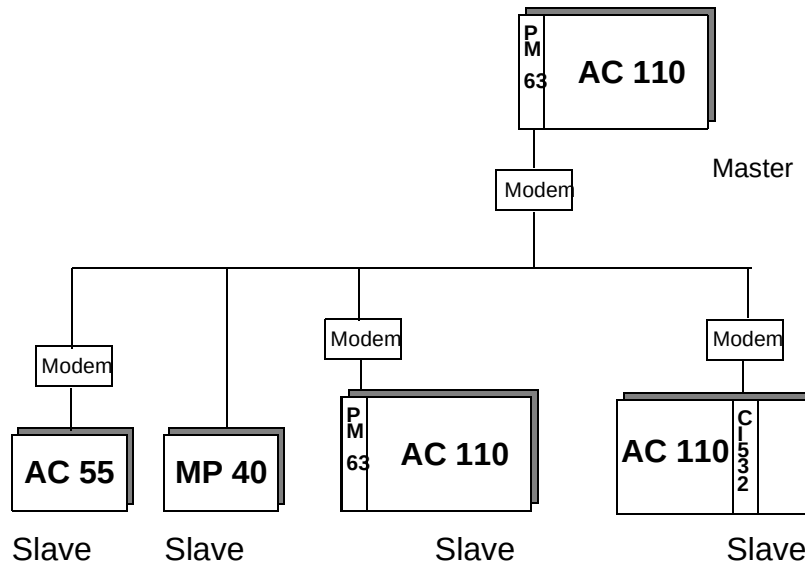


Figure 1-14. Configuration example with Advant Controller 110 as master

NOTE

The RCOM using SW driver allows only the use of one RCOM channel.

AC 110

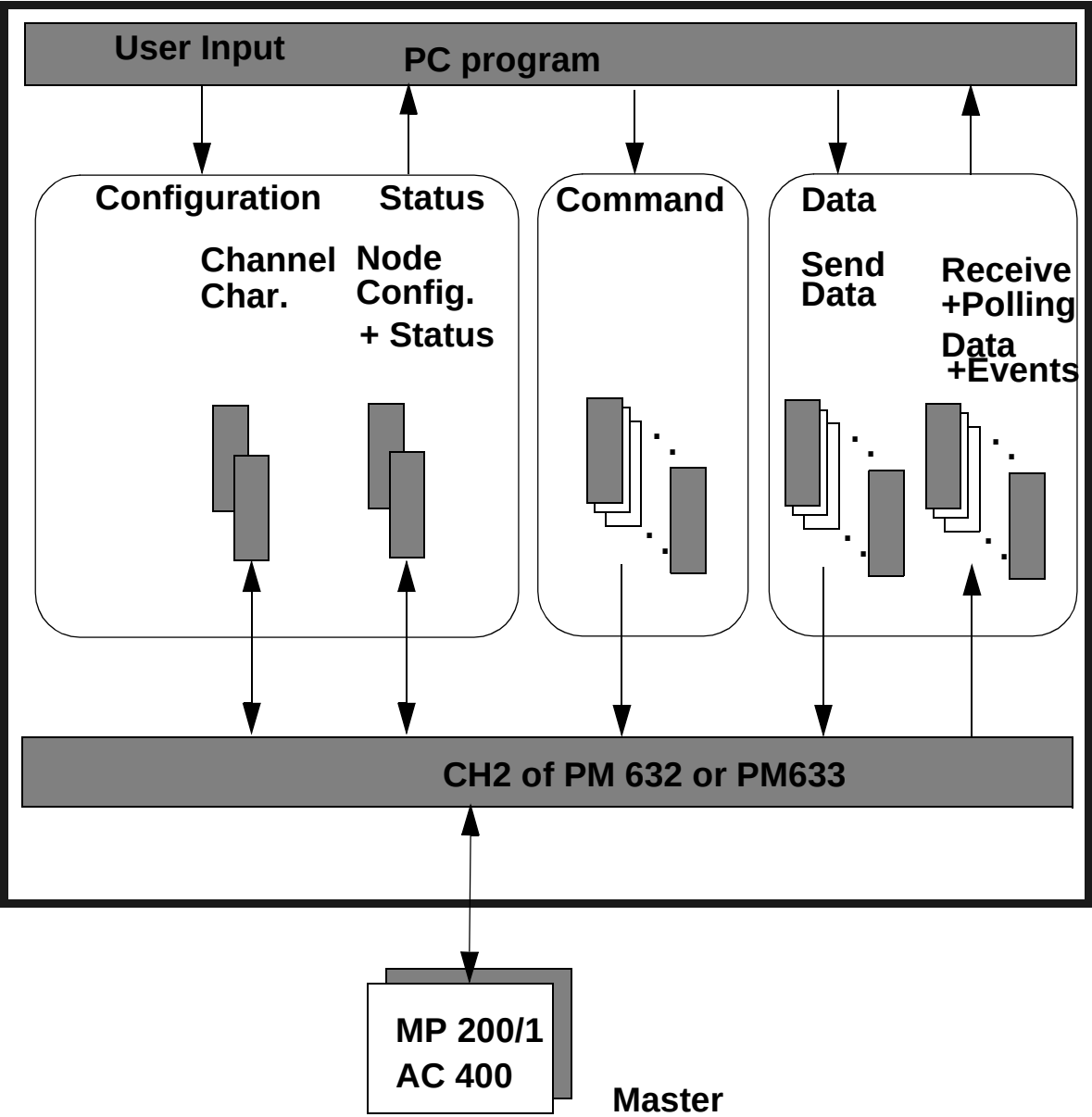


Figure 1-15. Functional overview in the Advant Controller 110 for RCOM networks using SW driver as slave.

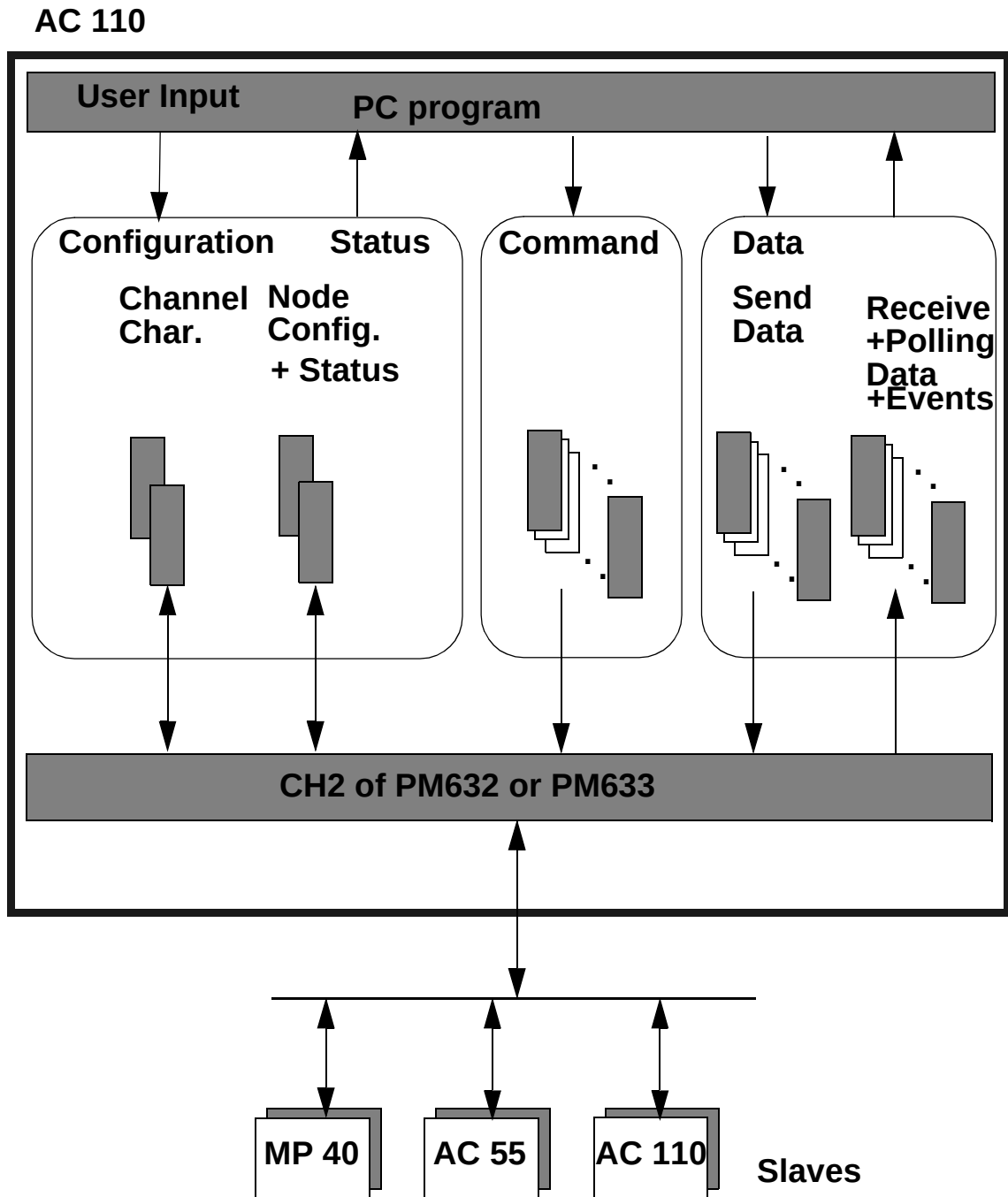


Figure 1-16. Functional overview in the Advant Controller 110 for RCOM networks using SW driver as master.

1.9.3 Functionality

Application = Function controlled from the application program.
System = Function controlled directly by the RCOM driver SW or by the SW driver.

The following RCOM functions are performed in **master mode**:

- Polling of Data MVB's and system messages from the slaves (System)
- Polling of Event Sets from Advant Controller 110 slaves (System)
- Read command to the slaves (Application)
- Write command to the slaves (Application)
- Reset of the sequence marks in the slaves (System)
- Clearing of the event queues in the slaves (System/Application)
- Setting of the clocks in the slaves (System/Application)
- Deblocking of event-driven transmission from the slaves (Application)
- Blocking of the slaves (Application)
- Dialing up the slaves (Application).

The following RCOM functions are performed in **slave mode**:

- Reply to the event polling from the master (System/Application)
- Reply to the read commands from the master (System)
- Execution of write commands from the master (System)
- Execution of Event Set writing from Advant Controller 110 master (System)
- Resetting of the sequence marks (System)
- Clearing of the event queue (System)
- Status query communications part (**RCOM Status Word**, RCSW) (System)
- Setting of the clock (System)
- Deblocking event-driven transmission (System)
- Blocking event-driven transmission (System)
- Dialing up the master (System/Application).

1.9.3.1 Functional Overview

The application programming required to use RCOM consists of two main parts, PC program and DB elements, see Figure 1-5.

PC program

The PC program is used for control of the data flow, the status and the commands of the Slave. In general the commands from master to Slave (see below) are activated from the PC program. Some commands may be executed automatically (e.g. Clock synchronization with dial-up, or cyclic data transfer).

If the RCOM channel is used as a slave and all data transfer is controlled from the master no PC program or flow control needs to be used in the slave (Advant Controller 110).

PC program in slave mode is needed if the RCOM channel is used with controlled data transfer to the master (e.g. data flow control in case of a dial up slave).

DB elements

These DB elements are divided into four parts:

- **DB elements for Configuration**
DB elements for module configuration (SC610, CI532, only if MVI is used)
DB elements for Channel Characteristics (defines transmission speed, time-outs etc.), DB elements for Node Configuration including node status (defines one node on the RCOM link and status information for flow control and error indication)
- **DB Elements for Commands**
Commands used to control slaves when in master mode.
(Cold-start, warm-start, clock synchronization etc.)
- **DB Elements for Data Transfer**
Handles the actual data transfer. (read, write, polling of data and events)
- **DB Elements for Event Handling (optional)**
The Advant Controller 110 supports the transfer of time-tagged events between a slave and a superior (master) station if the event option of Advant Controller 110 has been loaded. (Event handling).

RCOM slaves Advant Controller 110, AC 55 and MasterPiece 40 are supported.

For more information please see Section 1.9.4.5, Transfer of time-tagged Events.

1.9.4 Data Flow

1.9.4.1 Initiating a Connection

Before start-up the configuration of SC610 and CI532V01 or of the SW driver, respectively, is entered by the user. The RCOM channel will report configuration errors after application download, if the needed configuration is incomplete. In case of successful configuration the green RUN LED of the SC610 and CI532 is set when the MVI is used.

The node that is configured as master will start to send poll messages on the link when the configuration is complete, the RCOM channel correctly configured and the communication cable is connected to the slave (to the modem). When the slave sends a response on the poll message the communication link is established and ready for data transfer.

The RCOM channel will always restart if the Advant Controller 110 is restarted.

1.9.4.2 Data Transfer and Commands

Transfer Data

Both systems, the slave and the master, can at any time take initiative to send Data. In master mode the Data is transferred (Send and Receive) when the link is free for transmission.

In slave mode the Data is transferred when the master sends a poll message.

In master mode the RCOM channel always sends poll messages when nothing else is transferred on the link. (e.g. no commands).

Commands

Commands are used for control of the slaves. All Commands are only used in RCOM master mode, except for the telephone commands. The following commands can be used:

- Cold start
- Warm start/Block
- Normalize/Deblock
- Clock Synchronization
- Dial-up
- Hang-up.

Data Flow on the RCOM Link

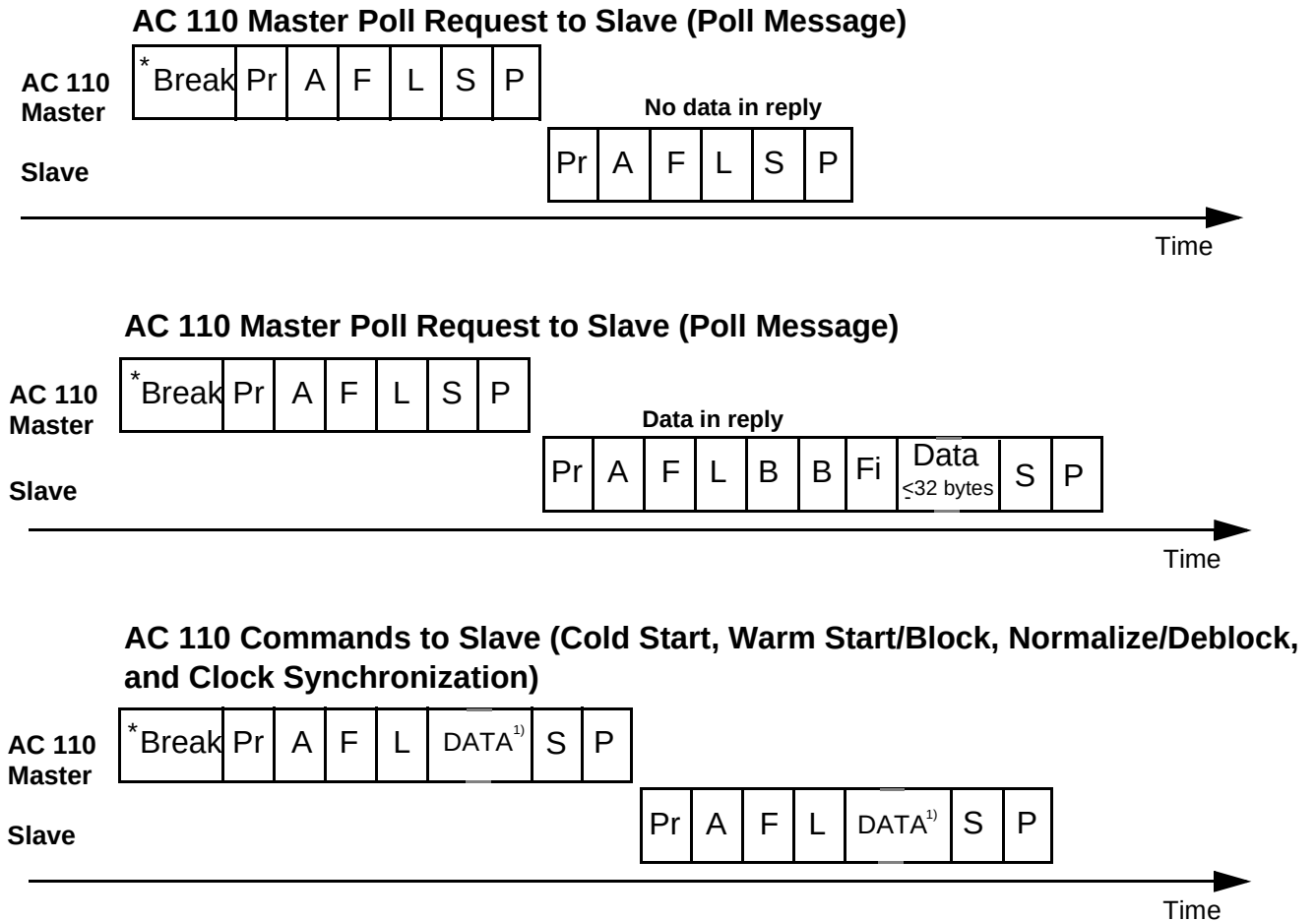


Figure 1-17. Data flow on the link during polling and commands

¹⁾ Not always included

* Not for RCOM Extended (PROTOTYPE=2 in DB element MVICHAN)

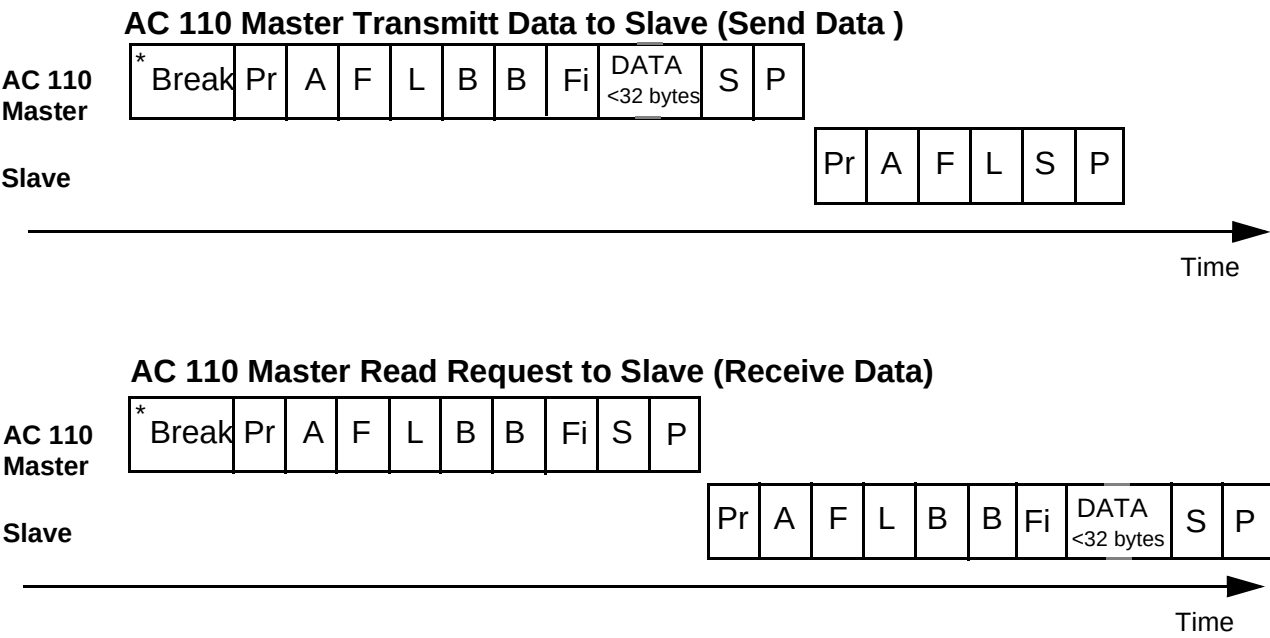


Figure 1-18. Data flow on the link during read command and data transmission

- BREAK(*)** Optional Start element sent by the master to the Slave to synchronize the communication. Only for RCOM not extended (PROTOTYPE=1 in MVICHAN) Character time-out (min. 3 characters) is used for synchronization of the communication in the case of RCOM Extended (PROTOTYPE=2 in MVICHAN)
- Pr** Preamble (HEX 00). Number of Preambles is selected in DB element MVICHAN.
- A** Address = The node number to the slave.
(The slave answers with its own node number.)
- F** Function code = Type of telegram.
- L** Length code = A unique code identifying the numbers of bytes in the message.
- DATA** Data elements.
- B B Fi** Identifies the Data elements.
First **B** = 0
Second **B** = IDENT (REGADDR in Advant Controller 110) on the slave
Fi = Number of DAT's
- S** Checksum (BCC), CRC Check(2 bytes) for RCOM Extended
- P** Postamble (HEX 00)

Data Flow on the RCOM Extended Link

The difference between RCOM and RCOM Extended is the Length of the Data part (Maximum 24 DAT elements and a Time stamp for RCOM Extended), the type of Checksum (CRC-16 for RCOM Extended) and RCOM Extended does not start a message with a Break signal (character time-out is used instead).

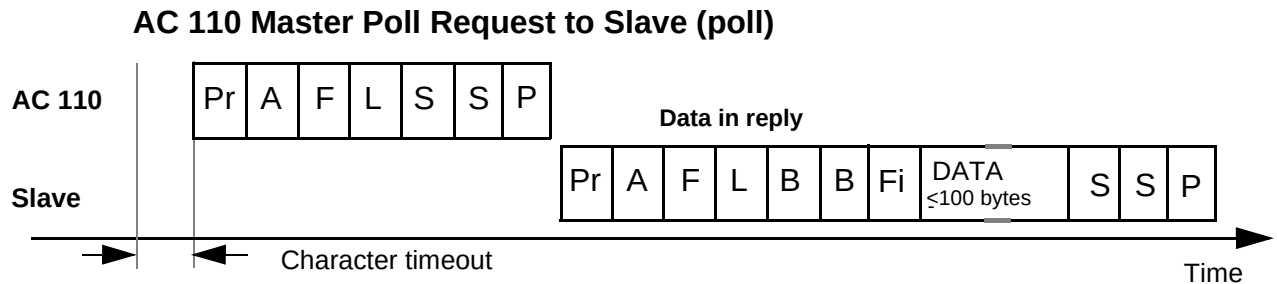


Figure 1-19. RCOM Extended data flow on the link during polling and data transmission

DATA Data elements. Maximum 24 DAT elements and a Time stamp.

S Checksum (CRC-16).

1.9.4.3 Flow Control

After successful Initialization the master node **automatically starts polling of all slave nodes** that are specified in the DB elements for configuration. If in the reply telegrams data are received, **the Advant Controller 110 system automatically writes the data to the internal addresses** as configured in the DB elements. **No PC program is needed for that.**

Dependent on the chosen application **commands can be sent to the slave, initiated by a PC program.** E.g. cold start, warm start, normalization as a single execution at the beginning, clock synchronization with cyclic execution.

A PC program and the system software supervise the user defined part of the data flow through the asynchronous port **by means of status information automatically received from the RCOM channel.**

If the link to the corresponding node is free Send and Receive Data transfers are operated.

1.9.4.4 MP 40 Data Flow

The MP 40 data flow is in accordance to the Advant Controller 110 description in Section , Data Transfer and Commands.

For MP 40 RCOM (not extended) is supported.

For MP 40 the commands are identical.

MP 40 also offers data and event reply to the poll messages according to the RCOM specification

The typical number of DAT's is 2 and 6 with an additional time stamp DAT. Thus the length 'Fi' (see above) of the telegrams is predefined.

The structure of MP 40 is firmware programmed, so the 'Idents' in the telegrams also have fixed meanings.

For further Information see MasterPiece 40 User's Manual.

1.9.4.5 Transfer of time-tagged Events

The system software in Advant Controller 110 supports transfer of time-tagged events from a slave to the superior (master) station if the event option SW of Advant Controller 110 is loaded.

The event handling option provides event detection and event transmission including handling of events from SOE (sequence of events) modules (e.g. DI650,DI651,DI652) in the same station, event transfer via Advant Fieldbus 100 (AF 100) or RCOM with Advant Controller 110 slaves, AC 55 slaves or MP 40 slaves and event queue handling for a superior station connected via RCOM or AF 100.

Advant Controller 110 slaves of an Advant Controller 110 master are supported with special DB elements EVS(T) for transit of time-tagged events to the superior station (AC 400 series, see figure 3.3). The time-tagged events of the station itself are send to the superior station by means of DB elements EVS(S)

MP 40 slaves are supported with special DB elements DIMVB, AIMVB which extract events from the polled data from MP 40.

Special applications are supported by special DB elements DIC, AIC for detection of digital and analog events from application PC program output.

The transfer of time-tagged events is handled automatically by the event option system software.

For this special event queues are provided, configured by the DB elements EVS(T) and EVS(S).

For more information see section event handling in the manual AMPL Configuration for Advant Controller 100 series and see the above mentioned DB elements in the manual Data Base Elements Reference Manual for Advant Controller 100 series.

Chapter 2 Installation

2.1 Site Planning Environment

You find guide lines for earth connection, power supply etc. in the manual ABB Master System Installation Rules. 7650 203-203

2.2 RCOM using MVI

2.2.1 Setup

CI532V01 is used for RCOM communication with other units in a proprietary, local control network. CI532V01 is equipped with two independent, CCITT V.24 (RS232-C), asynchronous communication channels. Standard Modems can be connected with standard cables. Modems and cables must be correctly installed. Figure 2-3 shows an example of necessary modems and cables in RCOM point-to-point and multidrop connections.

CI532V01 is used for RCOM communication with other units in a proprietary, local control network. Valid networks numbers for a local control network are 1 to 9. The AC 110 and every RTU (slave) connected to RCOM, must have a node number, 1 to 254, which is unique within the control network. The setup for each channel is made with the DB elements SC 610, CI532 and MVICHAN using the AS 120 ES engineering station.

You don't need to setup any jumpers or switches for RCOM.

You must check or fill in correct values on the following terminals on the DB elements SC 610, CI532 and MVICHAN (see tables below and figures below).

Table 2-1. Terminals for setup at the DB elements SC610, CI532, MVICHAN

Terminal	DB elements where to fill in the values	Recommended Value	Description
BUS	SC610, CI532	0	BUS number (For future use)
STATION	SC610, CI532	0	STATION number (I/O station number) 0 = Basic station, containing CPU
POSITION	CI532	6	POSITION of the carrier module within its station
SUBPOSIT	CI532	1,2	SUB module POS ition within the carrier module (1 = high position, 2= low position)
NET	MVICHAN	(1-9)	Own NET work number of MVI-channel
NODE	MVICHAN	(1-254)	Own NODE number of MVI-channel

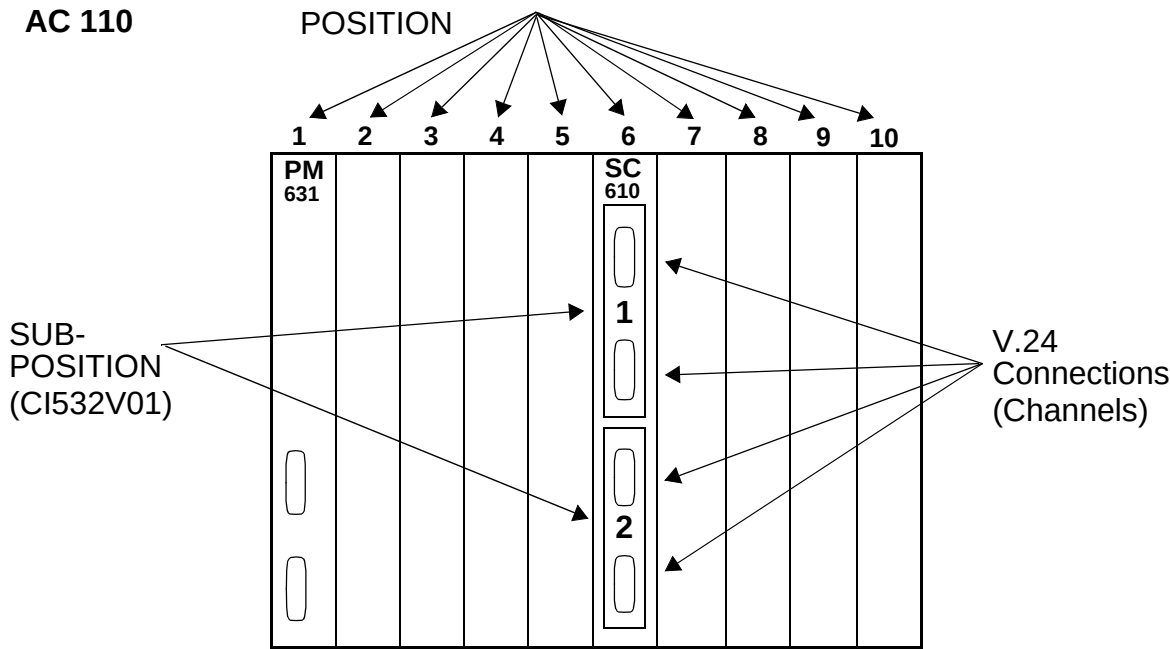


Figure 2-1. Position and subposition for CI532V01 in AC 110

Table 2-2. Description of CI532V01 connections according to CCITT V.24 (male connector)

Description	Signal	No. in 9 Pin Connector	No. in 25 Pin Connector	CCITT V.24	Direction
Data Carrier Detect	DCD	1	8	109	←
Receive Data	RD	2	3	104	←
Transmit Data	TD	3	2	103	→
Data Terminal Ready	DTR	4	20	108/2	→
Signal Ground	SG	5	7	102	↔
Data Set Ready	DSR	6	6	107	←
Request To Send	RTS	7	4	105	→
Clear To Send	CTS	8	5	106	←
Ring Indicator	RI	9	22	125	←

2.2.2 Start-up Procedures

To start-up the communication link you must set-up the hardware and the data base elements CI532 as described in Section 2.2.1, Setup.

The CI532V01 is restarted after power-up, after download of an application and after on-line changes automatically.

In master mode the CI532V01 always sends poll messages automatically when nothing else is transferred on the link. The poll messages can be seen at the modems LED indicators. (TXD in case of full duplex or TXD and RTS in case of half-duplex)

Check all the LED Indicators when you restart the CI532V01 module.

Check the Error Report. If there are no errors reported the CI532V01 is ok.

2.2.3 Product Verification

When the CI532V01 module is correctly installed and the corresponding CI532 data base element filled in, the following must be indicated:

- The green LED indicator on the front of the CI532V01 module must be lit.
- The green LED indicator on the front of the SC610 module must be lit.
- Data base element CI532 Terminals ERR = 0.

The DB element MVICHAN must show the following when the link is connected:

- DSR = 1
- CTS = 1 (full duplex) or toggling between 1 and 0 (half duplex)
- DCD = 1 (full duplex) or toggling between 1 and 0 (half duplex)
- ERR = 0.

When the link to an RTU is connected and transferring data the following applies for the terminal STATUS1 of the DB element MVINODE for the corresponding slave node:

- Link Status (bit 0) = 1
- Line Status (bit 1) = 1 in telephone mode
- For more information regarding the RTU Status information, see Chapter 3.6.1.3. DB Element for Node Configuration and Status MVINODE.

2.3 RCOM using SW Driver

2.3.1 Setup

The CH2 channel of the processor modules is used as an RCOM channel. The interface is an asynchronous communication channel according to CCITT V.24 (RS 232-C). Standard modems can be connected.

Modems and cables must be correctly installed. Figure 2-3 shows an example of necessary modems and cables in RCOM point-to-point and multidrop connections.

CH2 is used for RCOM communication with other units in a proprietary, local control network. Valid network numbers for a local control network are 1 to 9. The AC 110 and every RTU (slave) connected to RCOM, must have a node number, 1 to 254, which is unique within the control network. The setup for each channel is made with the DB element MVICHAN using the AS 120 ES engineering station.

You don't need to setup any jumpers or switches for RCOM.

You must check or fill in correct values on the following terminals on the DB elements MVICHAN (see tables below and figures below).

Table 2-3. Terminals for setup at the **DB** element **MVICHAN**

Terminal	DB elements where to fill in the values	Recommended Value	Description
NET	MVICHAN	(1-9)	Own NET work number of MVI-channel
NODE	MVICHAN	(1-254)	Own NODE number of MVI-channel

The processor module is always placed in position 1 of the basic subrack.

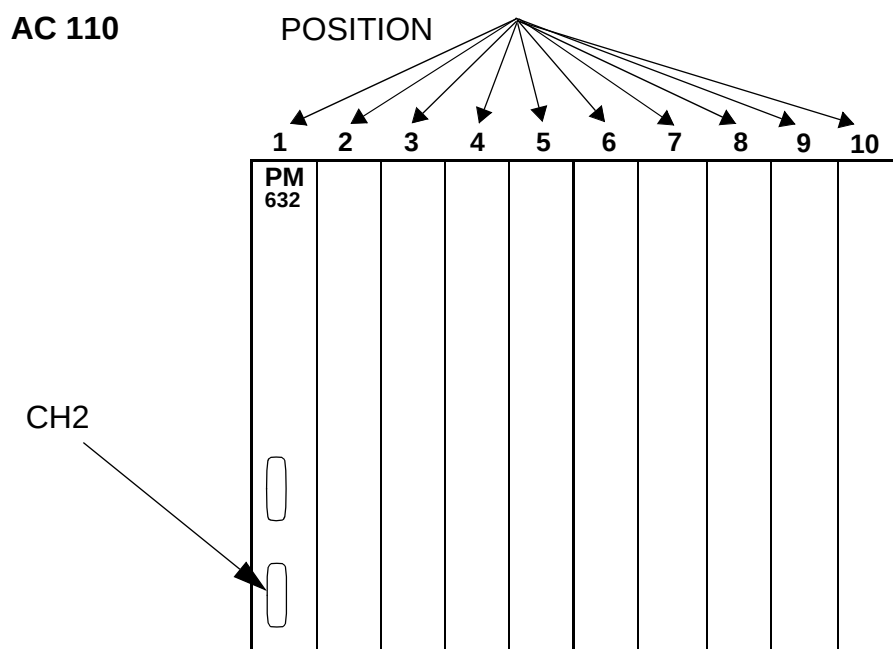


Figure 2-2. Position of CH2 on the processor module

Table 2-4. Description of CH2 connections according to CCITT V.24 (female connector)

Description	Signal	No. in 9 Pin Connector	No. in 25 Pin Connector	CCITT V.24	Direction
Data Carrier Detect	DCD	1	8	109	←
Receive Data	RD	2	3	104	←
Transmit Data	TD	3	2	103	→
Data Terminal Ready	DTR	4	20	108/2	→
Signal Ground	SG	5	7	102	↔
Data Set Ready	DSR	6	6	107	←
Request To Send	RTS	7	4	105	→
Clear To Send	CTS	8	5	106	←
Ring Indicator	RI	9	22	125	←

NOTE

Pins 2 and 3 are exchanged compared with the connector of CI532V01. CH2 of the processor modules has a female connector while CI532V01 has male connectors.

2.3.2 Start-up Procedures

To start-up the communication link you must set-up the processor module and the data base elements PM632 or PM633, respectively, as described in Section 2.2.1, Setup.

The RCOM channel is restarted after power-up, after download of an application and after on-line changes automatically.

In master mode the RCOM channel always sends poll messages automatically when nothing else is transferred on the link. The poll messages can be seen at the modems LED indicators. (TXD in case of full duplex or TXD and RTS in case of half-duplex)

Check the Error Report. If there are no errors reported the RCOM channel is ok.

2.3.3 Product Verification

The DB element MVICHAN must show the following when the link is connected:

- DSR = 1
- CTS = 1 (full duplex) or toggling between 1 and 0 (half duplex)
- DCD = 1 (full duplex) or toggling between 1 and 0 (half duplex)
- ERR = 0.

When the link to an RTU is connected and transferring data the following applies for the terminal STATUS1 of the DB element MVINODE for the corresponding slave node:

- Link Status (bit 0) = 1
- Line Status (bit 1) = 1 in telephone mode
- For more information regarding the RTU Status information, see Chapter 3.6.1.3. DB Element for Node Configuration and Status MVINODE.

2.4 Modems and Cables

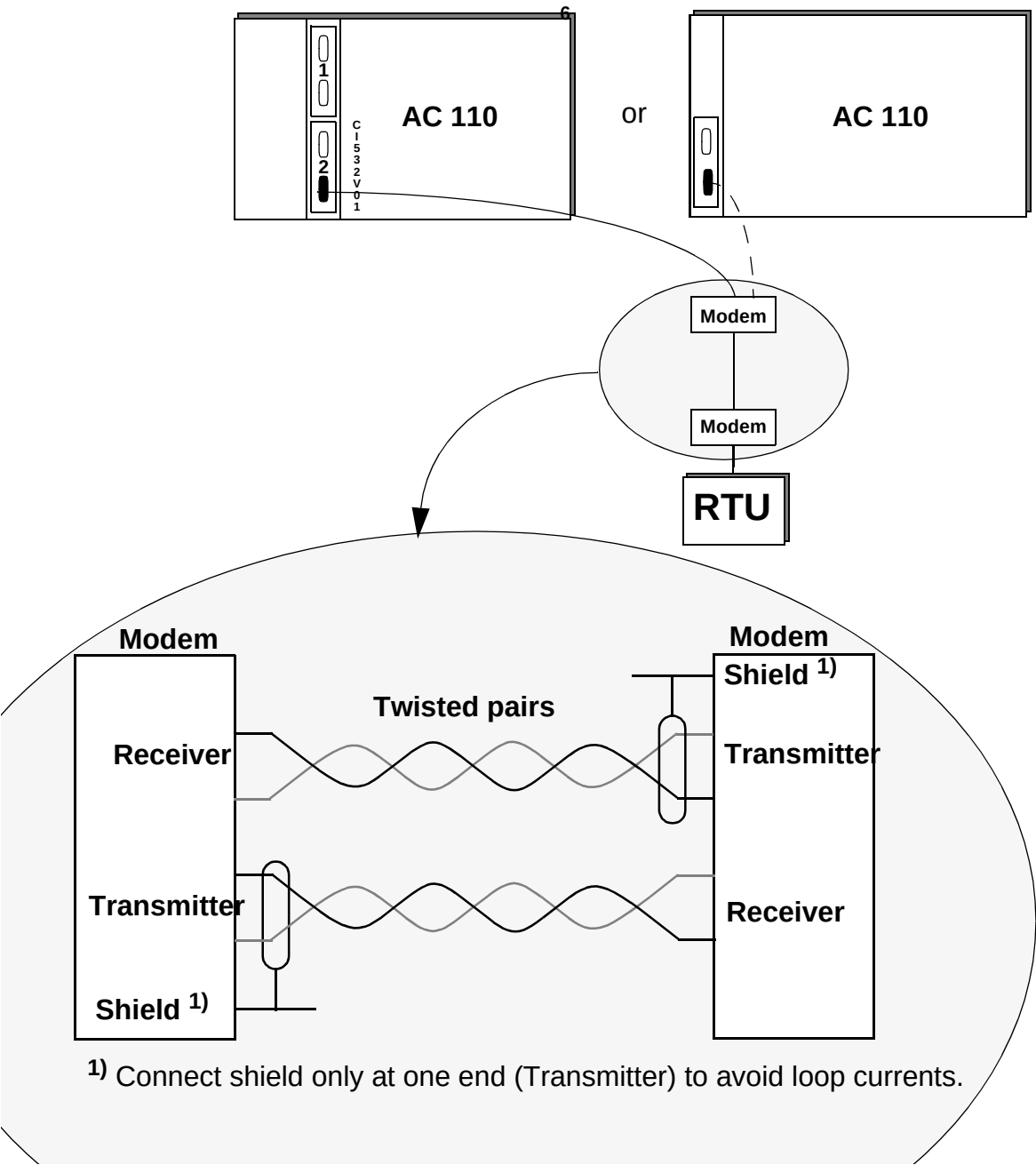


Figure 2-3. Cables and modems in a RCOM 4 wire full duplex point-to-point connection

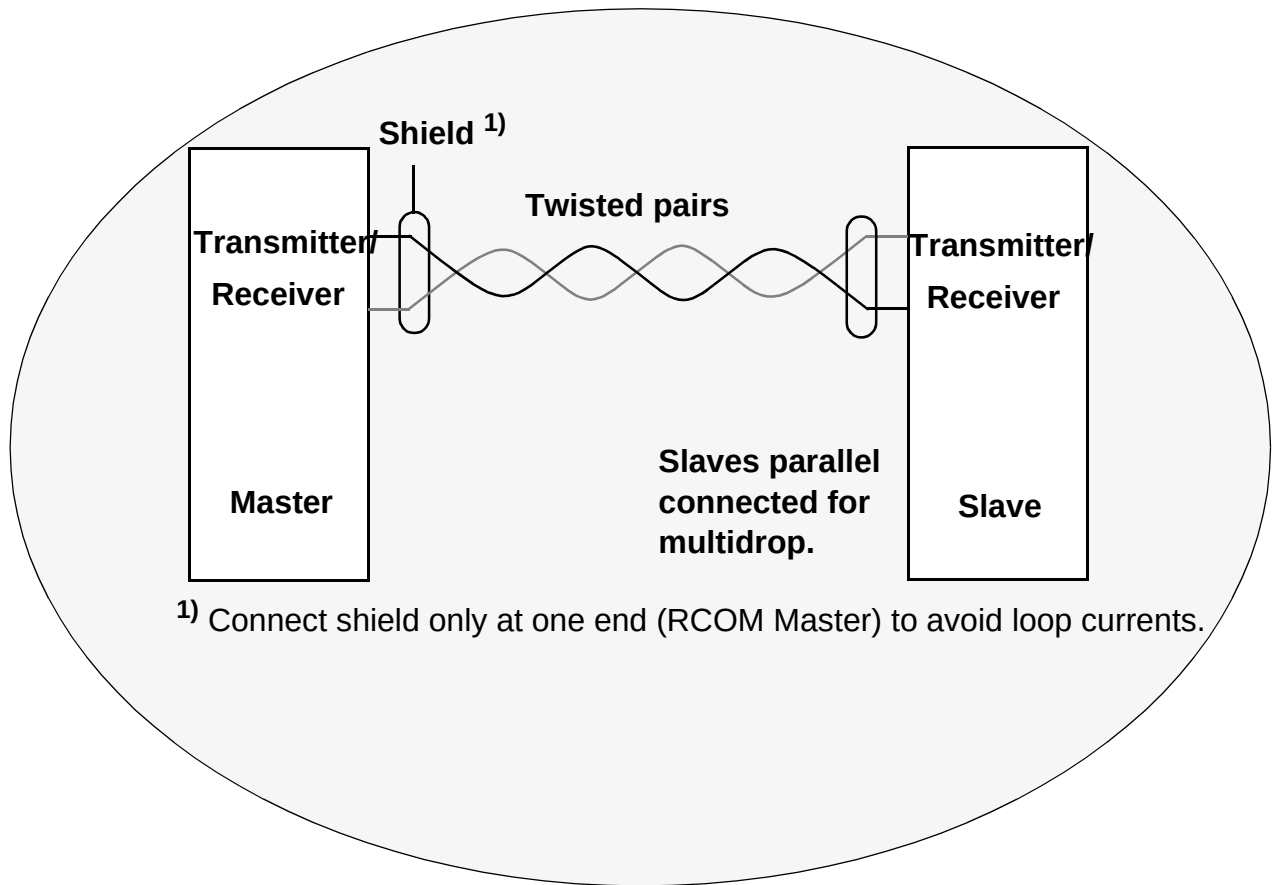


Figure 2-4. Cables and modems in a RCOM 2 wire point to point or multi-drop connection

When modems for point-to-point connections are used without control signals the modem cable must be wired for full duplex handling of modem signals as shown in the Figure 2-5. When standard modems are used no extra wiring is necessary.

Description	Signal	No. in 25 Pin Connector	CCITT V.24
Request To Send	RTS	4 —	105
Clear To Send	CTS	5 —	106
Data Set Ready	DSR	6 —	107
Data Carrier Detect	DCD	8 —	109
Data Terminal Ready	DTR	20 —	108/2

Figure 2-5. Necessary wiring in the cable when a modem without control signals is used.

The following modems and telecontrol cables are recommended:

Table 2-5. Modems and telecontrol cable

Version	Description
Modems for High speed communication 9600(19200) bit/s, point to point and multidrop	For communication to MP200/1, ⁽¹⁾ AC 400 series or other AC 110 or AC 55
Modems for low speed communication CCITT V.23 1200 bit/s, point to point or multidrop	Dito. but longer distances up to 22/ 35 km, and/or MasterPiece 40. ⁽²⁾
Modems for dial-up lines 1200/2400/9600 bit/s (Direct asynchronous mode, no break detect).	1200 bit/s for MasterPiece 40. For RCOM (not extended) ⁽²⁾
Telecontrol cable Communication cable for RCOM	One or two twisted pairs, each pair individually shielded. Conductor diameter up to 0.8(0.6)

(1) See RCOM User's Guide

(2) See MP 40 User's Manual

Chapter 3 Configuration/Application Building

3.1 Design considerations

To be able to setup the DB elements for the Configuration of the RCOM link you must define the following:

The network structure.

- Local control network numbers.
- Node numbers for all stations on the RCOM lines.
- Point-to-point, multidrop or switched telephone lines.
- The master and the slaves on the line.

The characteristics for the line.

- Transmission speed.
- Character length, number of stop bits, parity and duplex.
- Turnaround time in the RTU (Response time for a message).

Before you build the Command MVB's and the PC program for the control of the data flow on the link you have to decide the following:

How will the data be transferred from slave to master node?

- Master node reads data with a Read Request. See Section 3.8.6.2, Data Transfer from Slave to Master.
- Master receives data by polling the Slave.

Is it necessary to set the clock in the slave nodes from the master?

- Clock synchronization is described in Section 3.8.7.4, Clock Synchronization.

Is it necessary to initiate and block the slaves?

- Cold start, warm start/block and normalize/de-block are described in Section 3.8.7.1, Cold Start a Slave, Section 3.8.7.2, Warm Start/Block a Slave, Section 3.8.7.3, Normalize/Deblock a Slave.

How will the telephone commands be used?

- Telephone commands are described in Section 3.8.7.5, Telephone Commands.

To select the cycle time for the PC program you must know how fast data must be transferred.

3.2 Capacity

Each RCOM channel on is able to handle up to 340 MVB totally. Each MVB may contain up to 8 DAT (7 for event-driven transmission) *). Each DAT element contains 1 real value, 1 integer (2 or 4 bytes) or 32 booleans. An Advant Controller 110 using CI532 V01 can handle up to 500 MVB. Due to performance and capacity reasons, data which can change simultaneously should be collected into the same MVB.

RCOM Extended can have up to 24 DAT elements referenced by each MVB. (24 DAT's can also be used for event driven transmission when RCOM Extended is used.)

*) For MP 40: 2 DAT's for digital values(DI), 6 DAT's for analog values(AI).

3.3 Total Load on RCOM Link

The total load LR on a certain RCOM link (in %) can be calculated by following formula:

$$LR = LR_{MVB} + LR_{event} + LR_{clock}$$

where

LR_{MVB} = load caused by transmission of MVB elements (in %)

LR_{event} = load caused by transmission of time-tagged events from Event Sets (in %)

LR_{clock} = load caused by cyclic transmission of clock synchronizations (in %)

The load on the RCOM link must be less than 100%. Otherwise MVBs are transmitted with a cycle time higher than configured by the terminal CYCLETIM and the transmission of event-driven MVBs and time-tagged events is partly or fully suppressed.

The maximum performance of an RCOM link can be calculated for different configurations assuming a total load of 100%. If there are disturbances on the RCOM link the real performance can be less than the calculated one.

Below the calculation of the load portions is explained. Note that in every equation the values of the variables are inserted without units.

3.3.1 Transmission Time of MVB Elements

The transmission time of one MVB element (in ms) on the RCOM link can be calculated by following formula:

$$T_{MVB} = \frac{10000 \cdot (4 \cdot N + 30)}{S} + T_{respMaster} + T_{respSlave}$$

where

N = number of DATs in MVB

S = communication speed (bit/s), see terminal SPEED at DB element MVICHAN

T_{resp} = response time (ms), see table below

The response time is the time the RCOM channel needs to generate a telegram after receiving a telegram from another node and depends on the communication speed. Table 3-1 and Table 3-2 contain the response time for every allowed communication speed.

Table 3-1. MVI response time for RCOM using MVI

Communication speed S (bit/s)	MVI response time T_{resp} (ms)
150	300
300	200
600	150
1200	110
2400	110
4800	100
9600	100
19200	100

Table 3-2. Minimum response time using RCOM SW driver

Communication speed S (bit/s)	Response time $T_{respSlave}$ (ms)	Response time $T_{respMaster}$ (ms)
150	75	125
300	40	90
600	22	72
1200	13	63
2400	8	58
4800	6	56
9600	5	55

Table 3-2 shows minimum times at small system load. The response time can be prolonged by high system load or very long pieces of application program.
As long as application programs are executed the RCOM SW driver is delayed.

3.3.2 Load Caused by MVB Elements

The load of the RCOM link caused by the transmission of MVB elements (by read command, write command or polling) LR_{MVB} (in %) can be calculated by following formula:

$$LR_{MVB} = \sum_{i=1}^M \frac{T_{MVB}}{C_{MVB}} \times 100$$

where

M = number of MVB elements

T_{MVB_i} = transmission time of MVB element (ms)

C_{MVB_i} = cycle time of MVB element i (ms), i.e. terminal CYCLETIM multiplied by 100

If a MVB is transmitted in an event-driven way from a slave to the master (using the terminal EXECUTE) the cycle time from the terminal CYCLETIM can not be applied. In this case the

cycle time C_{MVB_i} can be derived from the average execution number of the MVB by following formula:

$$C_{MVB_i} = \frac{60000}{A_{exec_i}}$$

where

A_{exec_i} = average execution number of MVB i **per minute**

In Table 3-3 the transmission time and the load for some MVB elements is shown

The load L_{MVB} can be reduced by increasing the cycle time (terminal CYCLETIM) of the MVB elements.

Table 3-3. Transmission time and RCOM link load of MVB elements (MVI)
(examples)

Communi- cation speed S (bit/s)	Number of DATs	MVB terminal CYCLETIM	MVB cycle time C_{MVB_i} (ms)	Transmissio n time T_{MVB_i} (ms)	Load LR_{MVB} (%)
1200	1	16	1600	503	31
1200	8	128	12800	737	6
1200	24	512	51200	1270	2,5
9600	1	16	1600	235	15
9600	8	128	12800	265	2
9600	24	512	51200	331	0,6

Table 3-4. Minimum transmission time and RCOM link load of MVB elements (SW driver)
(examples)

Communi- cation speed S (bit/s)	Number of DATs	MVB terminal CYCLETIM	MVB cycle time C_{MVB_i} (ms)	Transmissio n time T_{MVB_i} (ms)	Load LR_{MVB} (%)
1200	1	16	1600	360	22,5
1200	8	128	12800	593	4,7
1200	24	512	51200	1126	2,2
9600	1	16	1600	96	6,0
9600	8	128	12800	125	1
9600	24	512	51200	192	0,4

3.3.3 Load Caused by Time-Tagged Events

The load of the RCOM link caused by the transmission of time-tagged events between Event Sets elements LR_{event} (in %) can be calculated by following formula:

$$LR_{event} = \left(\frac{500 \cdot (K + 3)}{S} + 0,5 \cdot K \right) \cdot \sum_{i=1}^K A_{event_i}$$

where

K = number of slave nodes

S = communication speed (bit/s)

A_{event_i} = average number of time-tagged events **per minute** from slave i

In Table 3-31 the load on the RCOM link caused by time-tagged events in different configurations is shown as an example.

Table 3-5. RCOM link load caused by time-tagged events (examples)

Communi- cation speed S (bit/s)	Number of slaves	Number of events per minute and slave $A_{tt_event_i}$	Load LR_{event} (%)
1200	4	1	20
2400	4	2	28
9600	8	1	36
9600	16	0,2	29

3.3.4 Load Caused by Clock Synchronization

The load of the RCOM link caused by the cyclic transmission of clock synchronization LR_{clock} (in %) can be calculated by following formula:

$$LR_{clock} = \frac{100000}{S \cdot C_{clock}}$$

where

S = communication speed (bit/s)

C_{clock} = cycle time of time distribution (s), see terminal PARAM6 at MVICHAN element

3.4 CPU Load From MVI Data Block Communication

3.4.1 RCOM using MVI

The CPU load caused by MVI Data Block communication L_{MVB} (in %) for RCOM using the CI532 V01 can be calculated by following formula:

$$L_{MVB} = \sum_{i=1}^M \left(0,15 + \frac{10 \cdot N}{C_{MVB_i}} \right)$$

where

M = number of MVB elements

N = number of DATs in MVB

C_{MVB_i} = cycle time of MVB element i (ms), i.e. terminal CYCLETIM multiplied by 100

The CPU load caused by a MVB element is independent from the RCOM command, the line characteristics etc. Table 3-3 shows the CPU load for some MVB elements.

Table 3-6. CPU load caused by MVB elements using MVI (examples)

Number of DATs	MVB terminal CYCLETIM	MVB cycle time C_{MVB_i} (ms)	Load L_{MVB} (%)
1	4	400	0,175
8	4	400	0,35
24	4	400	0,75
1	16	1600	0,156
8	128	12800	0,156
24	512	51200	0,155

How to calculate the total CPU load is described in the manual *AMPL Configuration for Advant Controller 100 series*.

3.4.2 RCOM using SW Driver

In this case the processor module's microprocessor controls the RCOM link. There are always RCOM telegrams on the link (even if no MVB are transferred the master polls the slaves) which causes a constant load independent from the load that the preparation of MVB requires. This constant load is reflected in the formula as an additional summand.

The CPU load (in %) caused by using the RCOM software driver can be calculated with the following formula::

$$L_{RCOM} = 0,0034 \cdot S + \sum_{i=1}^M \left(0,09 + \frac{0,26 \cdot N}{C_{MVB_i}} \right)$$

where

S = communication speed (bit/s), see terminal SPEED at the MVICHAN DB element

M = number of MVB elements

N = number of DATs in MVB

C_{MVB_i} = cycle time of MVB element i (ms), i.e. terminal CYCLETIM multiplied by 100

Tables Table 3-7 and Table 3-8 show CPU load examples

How to calculate the total CPU load is described in the manual *AMPL Configuration for Advant Controller 100 series..*

Table 3-7. CPU load caused by RCOM SW driver (examples)

Speed (bit/s)	L _{comm} %
9600	33
2400	8
1200	4
600	2
150	0,5

Table 3-8. CPU load caused by MVB elements using SW driver (examples)

Number of DATs	MVB terminal CYCLETIM	MVB cycle time C_{MVB_i} (ms)	Load L_{MVB} (%)
1	4	400	0,09
8	4	400	0,10
24	4	400	0,11
1	16	1600	0,09
8	128	12800	0,09
24	512	51200	0,09

3.5 Application Start-up

See Section 2.2.2, Start-up Procedures.

3.6 Tutorial

This example describes the necessary application programming for sending DAT's from a master node to a slave node and receive DAT's from the same slave.

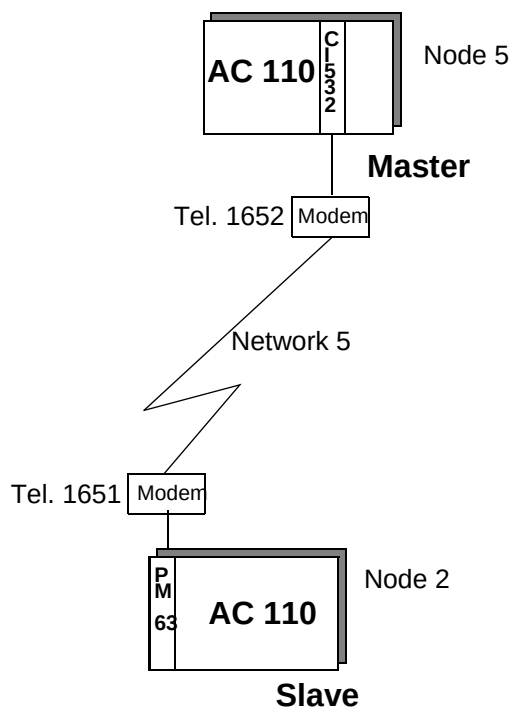


Figure 3-1. Configuration example

The configuration is a dial-up telephone line (one slave).

Configuration on the master node:

- CI532 Position number = 2
- Own node number = 5
- Network number = 5
- Own telephone number = 1625 (no switchboard).

Configuration on the Slave node:

- Node number = 2
- Network number = 5
- Telephone number = 1651 (no switchboard).

Configuration on the Modems:

- Transmission speed 9600 bits/s, full duplex
- Direct asynchronous mode
- Hayes without id
- No pause for dial tone after command
- DCD active
- DTR for modem reset.

3.6.1 Application in Master Node

3.6.1.1 DB Elements in the Master Node

Four **Configuration DB elements** must be build. Device configuration SC610, CI532, the channel characteristics MVICHAN, Node configuration and node Status MVINODE

Two **Command MVB's** are used: Dial-up and Normalize the slave.

Four Command MVB's are standard: Cold Start, Warm Start, Dial-up and Normalize the slave, we only use Dial-up and Normalize. Time synchronization is optional.

Two **Data MVB** are used for the actual data transfer. One MVB for Sending Data to the slave (cyclic and PC program initialized) and one MVB for Receiving Data from the slave.

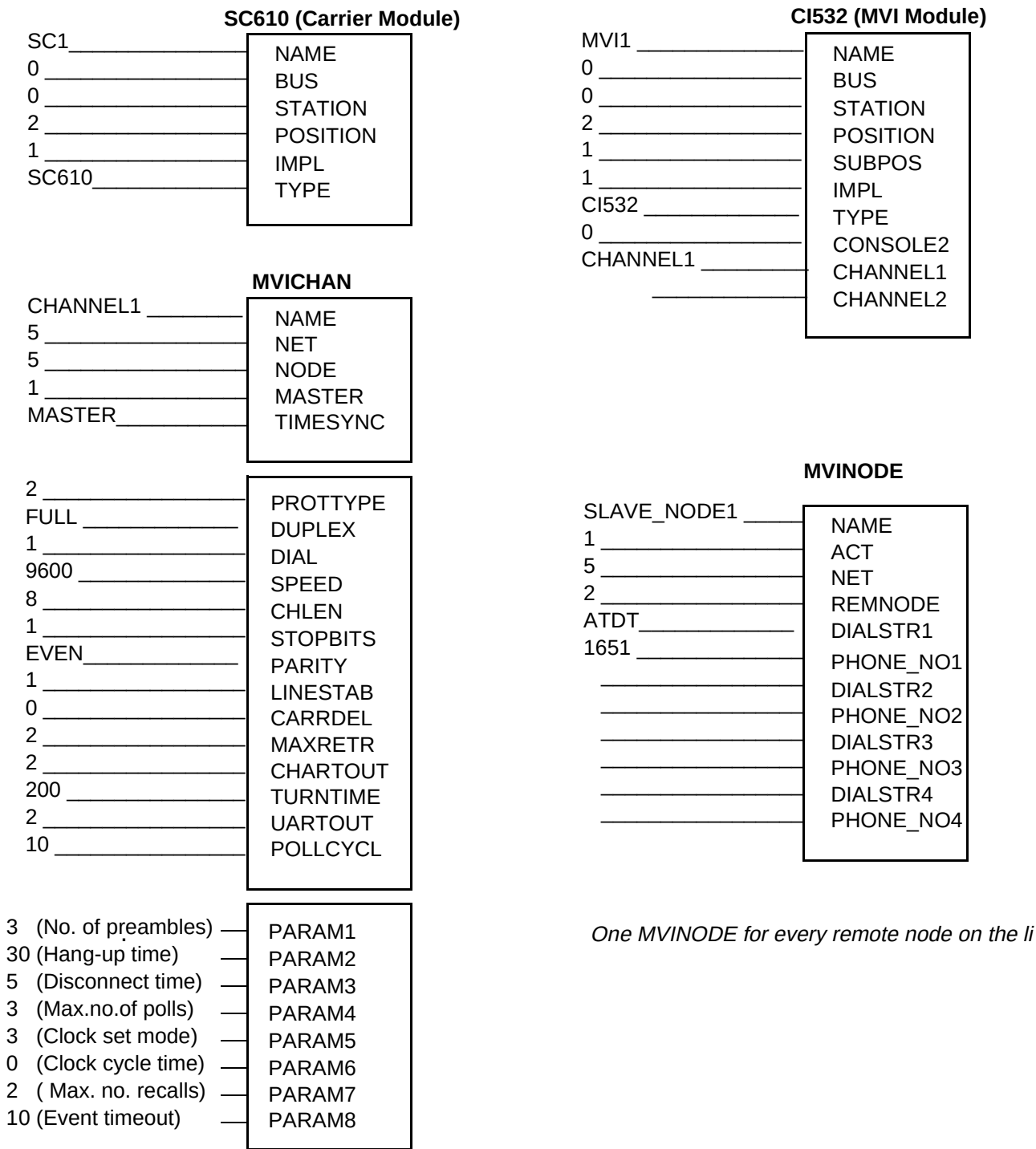


Figure 3-2. Configuration DB elements and RTU Status DB elements on the master

Cold Start-MVB		Warm Start-MVB	
COLD1 _____	NAME	WARM1 _____	NAME
1 _____	ACT	1 _____	ACT
1 _____	REGADDR	1 _____	REGADDR
301 _____	CMDCODE	302 _____	CMDCODE
0 _____	AUXINFO1	-1 _____	AUXINFO1
0 _____	AUXINFO2	0 _____	AUXINFO2
0 _____	NO_BREC	0 _____	NO_BREC
0 _____	NO_INT	0 _____	NO_INT
0 _____	NO_INTL	0 _____	NO_INTL
0 _____	NO_REAL	0 _____	NO_REAL
SEND _____	SOURCE	SEND _____	SOURCE
1 _____	BLOCKED	1 _____	BLOCKED
5 _____	NET	5 _____	NET
2 _____	REMNODE	2 _____	REMNODE
0 _____	CYCLETIM	0 _____	CYCLETIM
YES _____	SORT_REF	YES _____	SORT_REF

Normalization-MVB		Clock Synch.MVB	
NORMALIZE1 _____	NAME	CLOCK1 _____	NAME
1 _____	ACT	1 _____	ACT
1 _____	REGADDR	1 _____	REGADDR
305 _____	CMDCODE	308 _____	CMDCODE
-1 _____	AUXINFO1	0 _____	AUXINFO1
-1 _____	AUXINFO2	0 _____	AUXINFO2
0 _____	NO_BREC	0 _____	NO_BREC
0 _____	NO_INT	0 _____	NO_INT
0 _____	NO_INTL	0 _____	NO_INTL
0 _____	NO_REAL	0 _____	NO_REAL
SEND _____	SOURCE	SEND _____	SOURCE
1 _____	BLOCKED	1 _____	BLOCKED
5 _____	NET	5 _____	NET
2 _____	REMNODE	255 _____	REMNODE
0 _____	CYCLETIM	0 _____	CYCLETIM
YES _____	SORT_REF	YES _____	SORT_REF

Figure 3-3. Command MVB DB elements on the master

DIAL-UP MVB		HANG-UP MVB	
DIAL1_____	NAME	HANGUP1_____	NAME
1_____	ACT	1_____	ACT
1_____	REGADDR	1_____	REGADDR
3_____	CMDCODE	4_____	CMDCODE
0_____	AUXINFO1	0_____	AUXINFO1
0_____	AUXINFO2	0_____	AUXINFO2
0_____	NO_BREC	0_____	NO_BREC
0_____	NO_INT	0_____	NO_INT
0_____	NO_INTL	0_____	NO_INTL
0_____	NO_REAL	0_____	NO_REAL
SEND_____	SOURCE	SEND_____	SOURCE
1_____	BLOCKED	1_____	BLOCKED
5_____	NET	5_____	NET
2_____	REMNODE	2_____	REMNODE
0_____	CYCLETIM	0_____	CYCLETIM
YES_____	SORT_REF	YES_____	SORT_REF

READ MVB		WRITE MVB	
READ1_____	NAME	WRITE1_____	NAME
1_____	ACT	1_____	ACT
1_____	REGADDR	2_____	REGADDR
110_____	CMDCODE	210_____	CMDCODE
0_____	AUXINFO1	0_____	AUXINFO1
0_____	AUXINFO2	0_____	AUXINFO2
0_____	NO_BREC	2_____	NO_BREC
0_____	NO_INT	4_____	NO_INT
4_____	NO_INTL	0_____	NO_INTL
0_____	NO_REAL	0_____	NO_REAL
RECEIVE_____	SOURCE	SEND_____	SOURCE
0_____	BLOCKED	1_____	BLOCKED
5_____	NET	5_____	NET
2_____	REMNODE	2_____	REMNODE
0_____	CYCLETIM	8_____	CYCLETIM
YES_____	SORT_REF	YES_____	SORT_REF

Figure 3-4. Command MVB DB elements on the master

3.6.1.2 The PC Program in the Master Node

The **PC program** in the master node is designed to send a **Normalization/-Deblock** to the slave each time when the link to the slave is connected. After this a **data MVB is read by the Read command**. As long as the link is up **this MVB is updated by polling**. The **data is sent to the slave cyclically** every 1,6 seconds. The link and line status is fetched from the RTU Status 1 available in the terminal STATUS1 of the DB element MVINODE (bit 0 and bit 1).

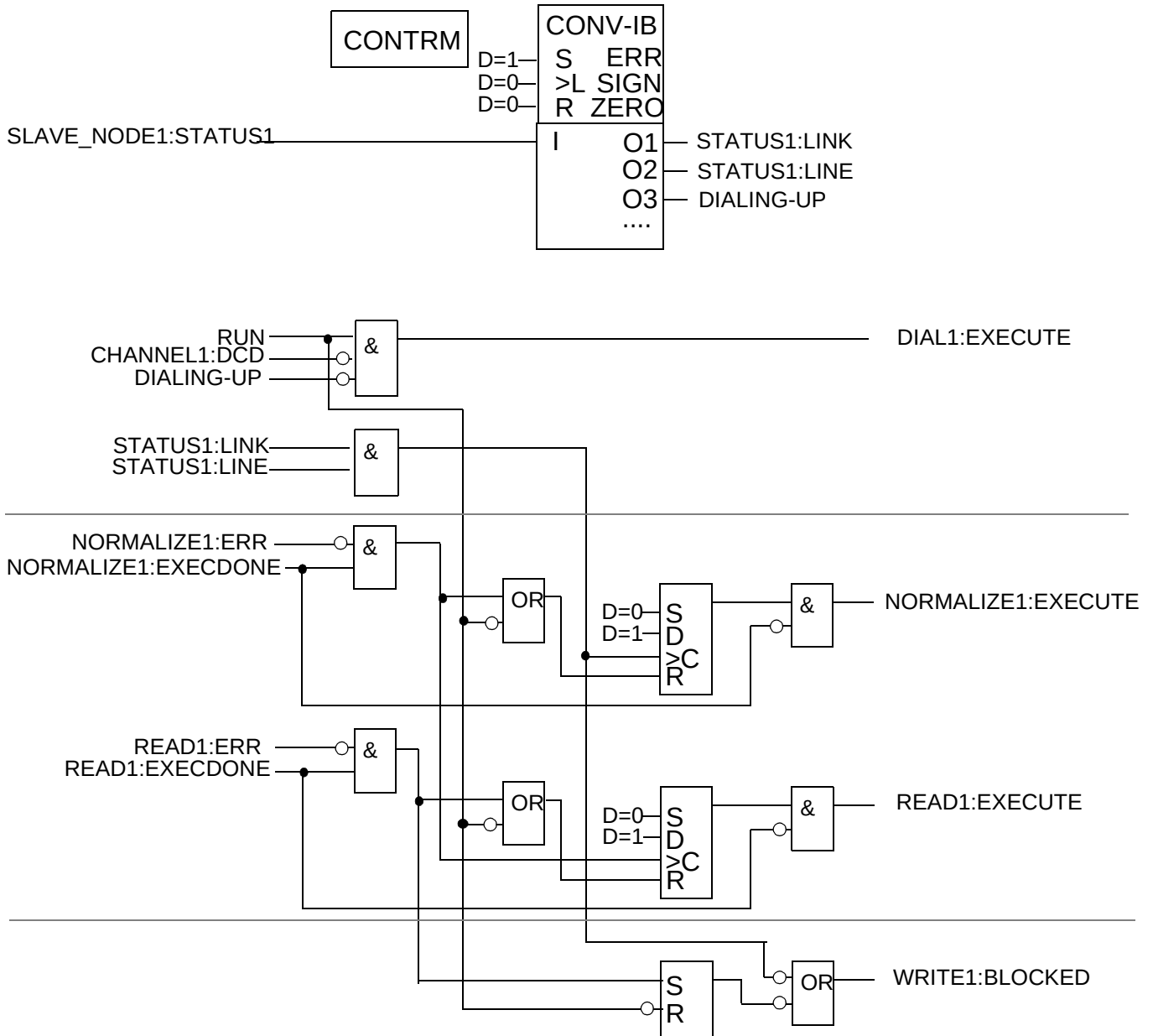


Figure 3-5. PC program for telephone command, normalizing the slave and sending data

3.6.2 Application in Slave Node

3.6.2.1 DB Elements in the Slave Node

The slave node uses the RCOM SW driver. Therefore SC610 and CI532 are not needed, nor are their DB elements.

No **Command MVB**'s are used.

Two **Data MVB**'s are used for the actual data transfer. One for Sending Data to the master and one for Receiving Data from the master.

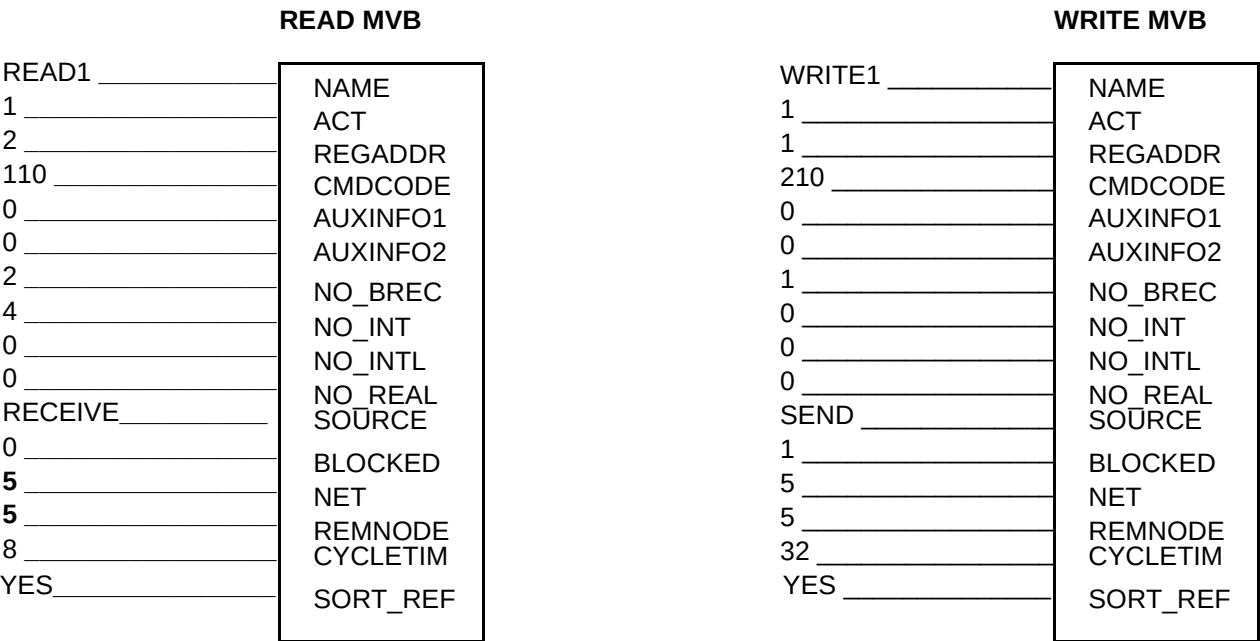


Figure 3-6. Data MVB's on the slave

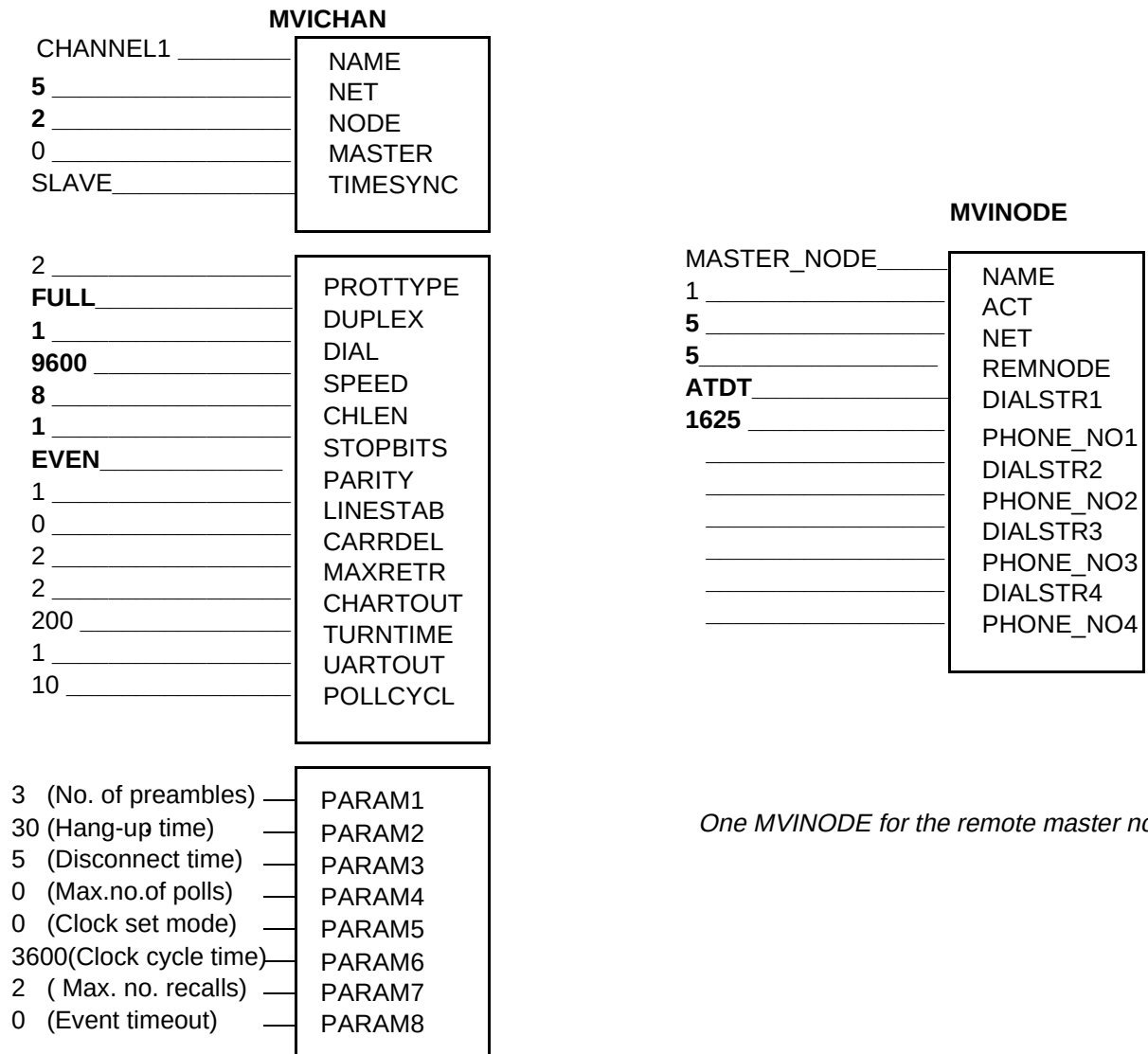


Figure 3-7. Configuration and RCOM status DB elements on the slave

3.6.2.2 PC Program in the Slave Node

The **PC program** is designed to send then value of the digital input signal DI1.1 to the master each time the signal value has been changed. For that, the MVB WRITE1 is sent to the master in event-driven way.

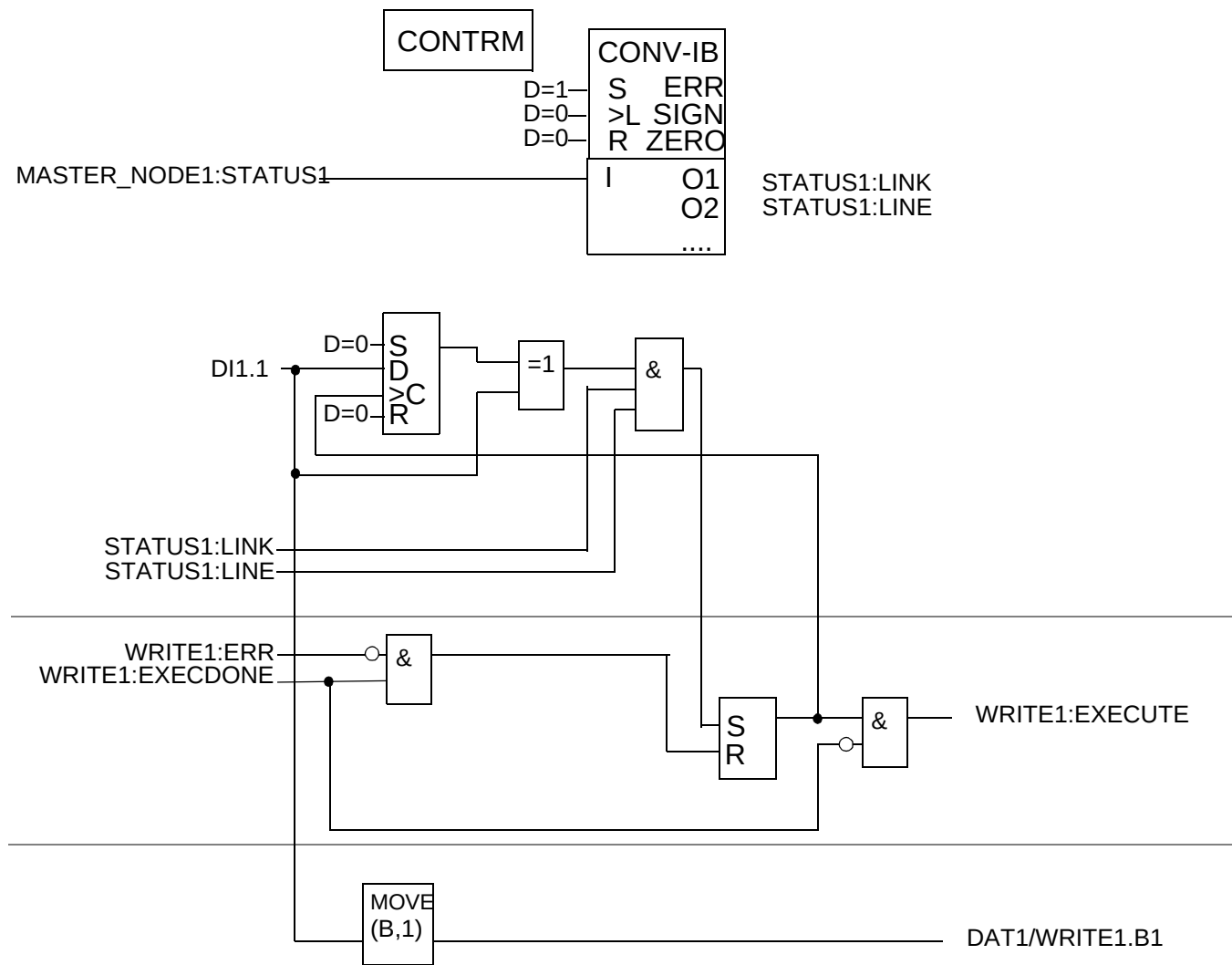


Figure 3-8. PC program for event driven transmission of digital input data to the master node

3.7 Application Procedures

Configuration

The configuration of the carrier module SC610, of the CI532 V01 submodules, of the channels, lines and nodes is built with special DB elements.

DB elements for Configuration

DB element for configuration of the Carrier Module 'SC610'. The DB Element SC610 is described in Section 3.8.1.1, DB Elements for MVI Module Configuration SC610, CI532

DB element for configuration of the MVI-Device 'CI532'. The DB Element CI532 is described in Section 3.8.1.1, DB Elements for MVI Module Configuration SC610, CI532

DB elements for Channel Characteristics of the MVI channels 'MVICHAN' (Defines transmission speed, time-outs etc.), The DB Element MVICHAN is described in Section 3.8.3, DB Element for MVI Channel Characteristics MVICHAN.

DB elements for Node Configuration 'MVINODE' (defines one node on the RCOM link and the node status with information for flow control and error indication). The DB Element MVINODE is described in Section 3.8.4, DB Element for Node Configuration and Status MVI-NODE.

In case of RCOM using MVI the **DB Elements for configuration of the carrier module and the MVI device and channel characteristics and node configuration must always be defined**. If they are not built at start-up of the CI532 submodule, application errors will be reported.

Application building

DB elements for Commands

The 'MVB' DB elements are used for commands to control slaves when RCOM channel is used in master mode and for the dial-up/hang-up (telephone) command. The DB Element MVB is described in Section 3.8.7, DB Element MVB for Commands.

DB elements for Data

The 'MVB' DB elements handle the actual data transfer (read, write, polled data/ MP 40-events in master and slave mode). The DB Element MVB for data transfer is described in Section 3.8.6, DB Element MVB for Data Transfer.

PC program

The PC program controls the commands and controls and checks the data flow through the asynchronous port by means of the status information received from the RCOM channel. The PC program activates the execution of Command MVB and the Data MVB (see below). The PC program is described in Section 3.8.8, PC Program Layout.

The application programming required to use RCOM consists of two main parts, PC program and DB elements see figure below.

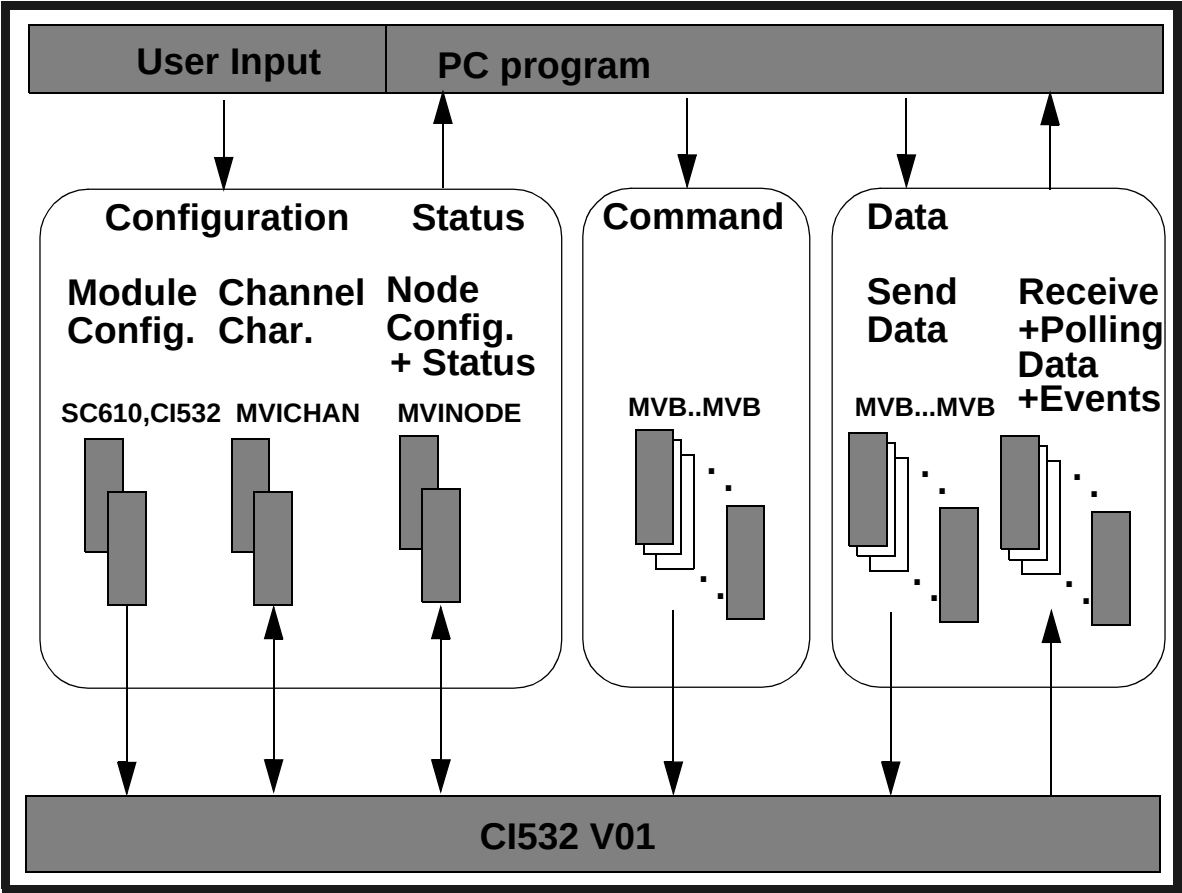


Figure 3-9. Overview of the application for RCOM using MVI

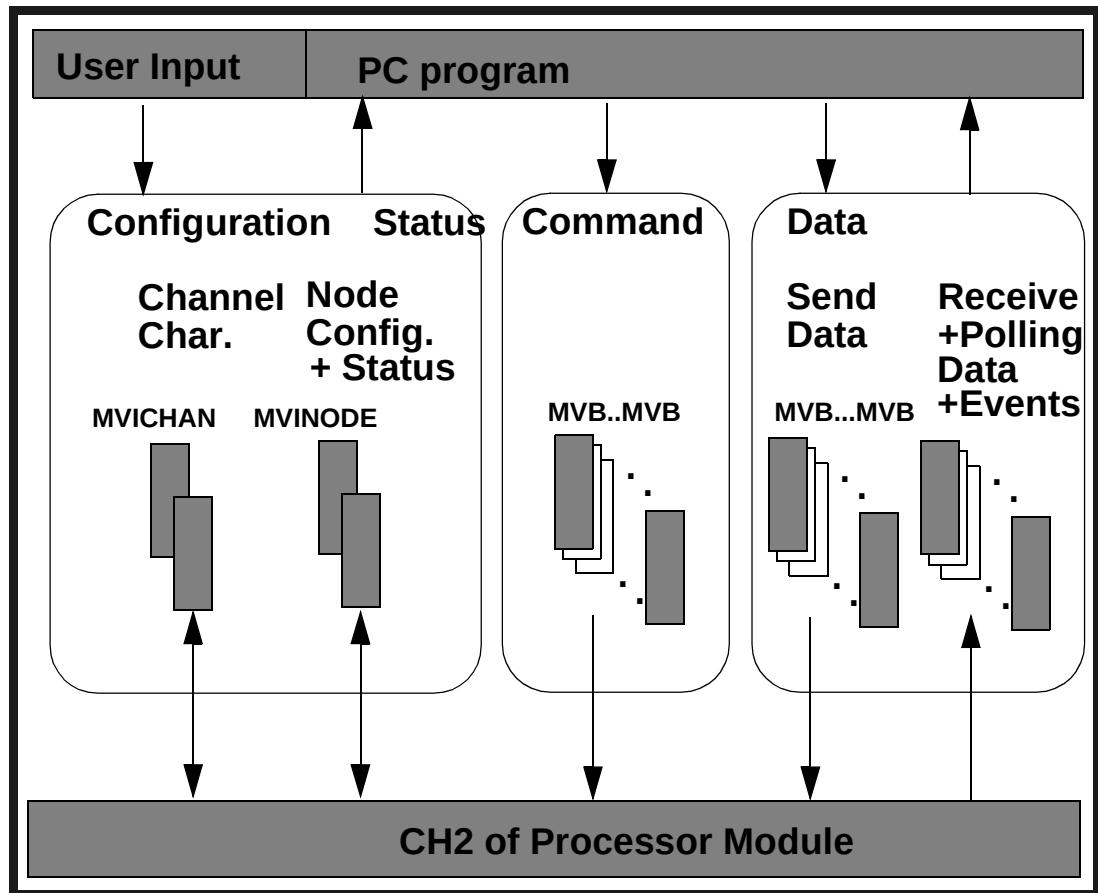


Figure 3-10. Overview of the application for RCOM using SW driver

3.7.1 Master Functions

The functions mentioned below can be defined/controlled at **application** level in master mode.

- **Data (event) polling of MVB from the slaves.**
See Section 3.8.6.2, Data Transfer from Slave to Master for further information.
- **Writing of MVB to the slaves.**
See Section 3.8.6.1, Data Transfer from Master to Slave for further information.
- **Reading of MVB from the slaves.**
See Section 3.8.6.2, Data Transfer from Slave to Master for further information.
- **Cold start of the slaves.**
See Section 3.8.7.1, Cold Start a Slave for further information.
- **Warm start/blocking of the slaves.**
See Section 3.8.7.2, Warm Start/Block a Slave for further information.
- **Normalization/deblocking of the slaves.**
See Section 3.8.7.3, Normalize/Deblock a Slave for further information.
- **Setting the clocks in the slaves.**
See Section 3.8.7.4, Clock Synchronization for further information.
- **Dialling-up of the slaves.**
See Section 3.8.7.5, Telephone Commands for further information.

3.7.2 Slave Functions

The functions mentioned below can be defined/controlled at **application** level in slave mode:

- **Reception of MVB from the master**
See Section 3.8.6.1, Data Transfer from Master to Slave for further information.
- **Transmission of MVB to the master (read by the master).**
See Section 3.8.6.2, Data Transfer from Slave to Master for further information.
- **Transmission of polled MVB to the master**
See Section 3.8.6.2, Data Transfer from Slave to Master for further information.
- **Dialling-up of the master.**
See Section 3.8.7.5, Telephone Commands for further information.

3.8 Configuration of RCOM Application DB Elements and PC Program

3.8.1 DB Elements for Configuration of RCOM using MVI

This chapter describes the configuration DB elements, used to configure the SC610 carrier module and the CI532 V01 submodules. These DB elements contain setup information for the hardware and software of the modules. The Status information received from CI532 V01 can be used by the application program for control

In an AC110 with RCOM option one carrier module SC610 with up to two MVI submodules CI532V01 can be used. Each MVI module CI532V01 includes two communication channels

In the figure below the hierarchy of these DB elements is shown.

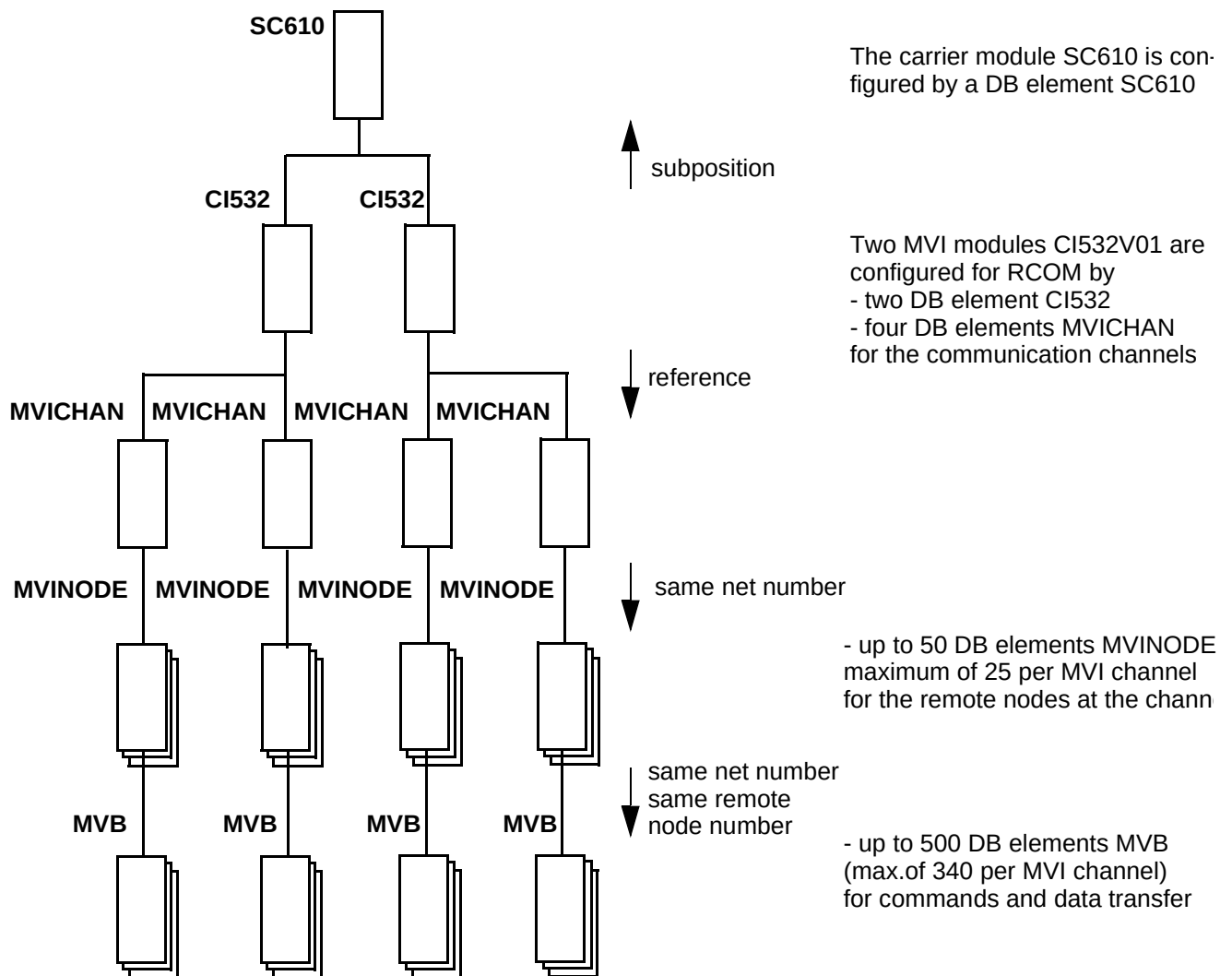


Figure 3-11. Hierarchy of DB elements for modules SC610/CI532V01 for RCOM using MVI

3.8.1.1 DB Elements for MVI Module Configuration SC610, CI532

DB element SC610

The DB element SC610 represents an SC610 carrier module needed for CI532.

Call name: SC610
Element type: Carrier module
Item designation: SCx

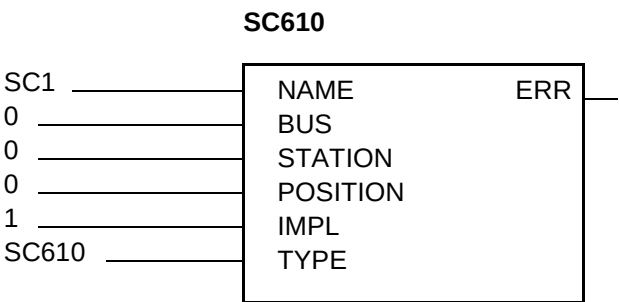


Figure 3-12. Example of a DB element SC610

Table 3-9. Description of the **DB element SC610**

Terminal	Allowed Values	Recommended Value	Description
NAME	max. 20 characters	SCx	Unique module NAME
BUS	0	0	BUS number.(For future use)
STATION	0-7	0	STATION number (I/O station number) 0 = Basic station, containing CPU.
POSITION	2-.10		POSITION of the module within its station
IMPL	0,1	1	IMPL emented 0 = the element is spare 1 = the module is implemented
TYPE	SC610	SC610	module TYPE
ERR			ERR or

DB element CI532

The DB element CI532 describes the configuration of a module CI532, the Multi Vendor Interface(MVI). The MVI is used for transmission of process data and event data via telecommunication line. Different communication protocols are supported. The version CI532V01 is a MVI supporting the protocols RCOM and RCOM Extended. The layout of the DB element CI532 is shown in the figure below.

Call name: CI532
Element type: MVI
Item designation: MVIx

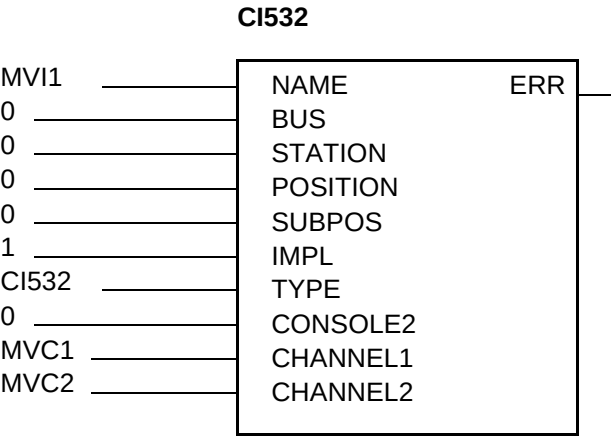


Figure 3-13. Example of a DB element CI532

The Terminals of the DB element CI532 are explained in Table 3-10.

Table 3-10. Description of the **DB element CI532**

Terminal	Allowed Values	Recommended Value	Description
NAME	max. 20 characters	MVlx	Unique module NAME
BUS	0	0	BUS number (For future use)
STATION	0-7	0	STATION number (I/O station number) 0 = Basic station, containing CPU
POSITION	2-10		POSITION of the carrier module within its station
SUBPOS	1,2		SUB module POS ition within the carrier module (1 = high position, 2= low position)
IMPL	0,1	1	IMPL emented 0=the element is spare 1=the module is implemented
TYPE	CI532	CI532	Module TYPE
CONSOLE2	0,1	0	CONSOLE functions for MVI channel 2 , for test and fault tracing 1=Console function enabled 0=Console function disabled
CHANNEL1	max. 20 characters	MVC1	REF of DB element MVICHAN defining MVI CHANNEL 1
CHANNEL2	max. 20 characters	MVC2	REF of DB element MVICHAN defining MVI CHANNEL 2
ERR			ERR or 0=no error 1=non functional module

3.8.2 DB Elements for Configuration of RCOM using SW Driver

This chapter describes the configuration DB elements used to configure RCOM using the SW driver. Only one channel is possible.

In the figure below the hierarchy of the DB elements is shown

In the figure below the hierarchy of these DB elements is shown.

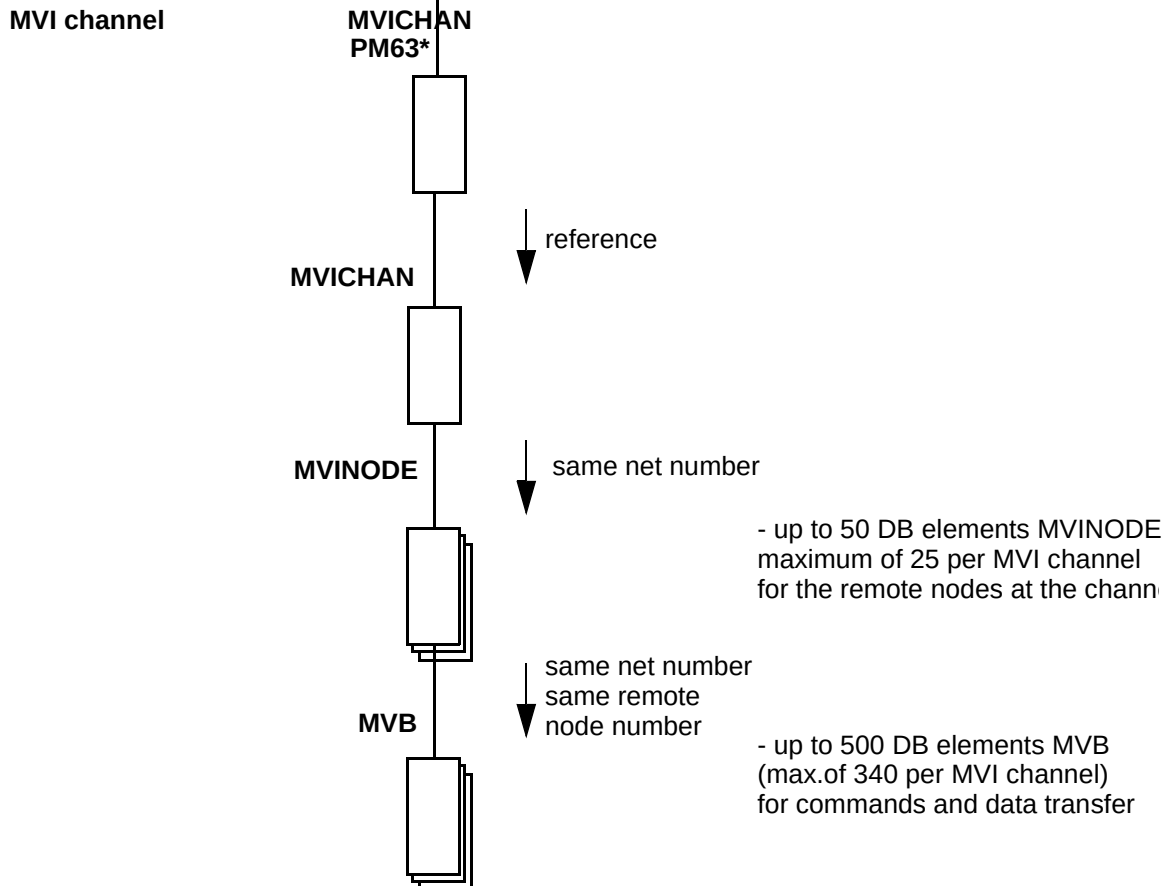


Figure 3-14. Hierarchy of DB elements for modules SC610/CI532V01 for RCOM using SW driver

3.8.3 DB Element for MVI Channel Characteristics MVICHAN

The channel characteristics of RCOM are specified in one MVICHAN DB element for each asynchronous communication channel. So CI532V01 is fully configured by two MVICHAN DB elements and one DB element CI532.

The SW driver utilizes only one MVICHAN element.

DB element MVICHAN

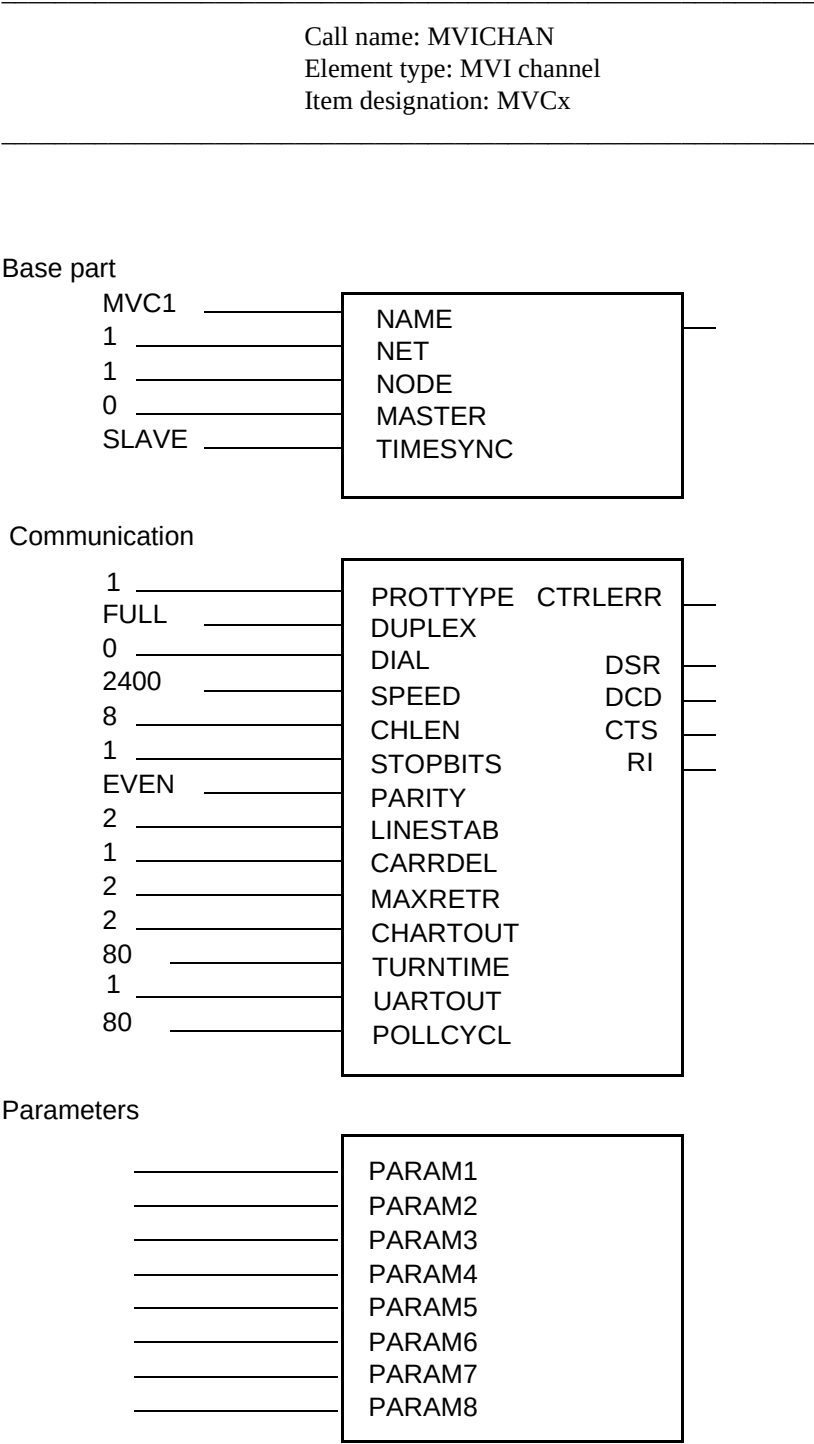
The DB element MVICHAN specifies the configuration of a MVI channel and access of status of modem control signals.

Configuration of:

- Master or slave mode.
- Protocol type RCOM or RCOM Extended.
- Standard communication parameters (speed, no. of bits, parity, duplex, timing etc.).
- RCOM specific communication parameters (No. of retransmissions, time-outs etc.).
- Automatic control of slaves.

Status indication of modem control signals, errors.

The layout of the DB element MVICHAN is shown in Figure 3-15.



Terminals Base Part of the DB element MVICHAN

Table 3-11. Description of the DB element MVICHAN, base part

Terminal	Allowed Values	Recommended Value	Description
NAME	max. 20 characters	MVC1	Unique module NAME
NET	1-9		Own NET work number of MVI-channel NET number is unique in the control network. The on-line change is denied for this terminal.
NODE	1-254		Own NODE number of MVI-channel. Must be the same for all DB elements MVICHAN. The on-line change is denied for this terminal.
MASTER	0/1		MVI channel in 1 = MASTER mode 0 = slave mode
TIMESYNC	NONE MASTER SLAVE	MASTER SLAVE	MVI TIME SYN chronization In MVI master mode (terminal MASTER=1) MASTER = time synchronization according PARAM5. In MVI slave mode (terminal MASTER=0) SLAVE = time synchronization slave NONE = no time synchronization.
ERR			ERR or 0=no error 1=channel error The terminal ERR is set when the reading of an terminal DSR, DCD, CTS, RI or CTRLERR failed (BIOB bus error).

Terminals Communication part of the DB element MVICHAN

Table 3-12. Description of the **DB element MVICHAN, communication part**

Terminal	Allowed Value	Recommended Value	Description
PROTOTYPE	1/2	2 or 1 (MP 40, MP 200)	PROTOCOL TYPE 1 = RCOM. RCOM with 'break', max 8 DAT's 2 = RCOM Extended. RCOM without 'break', max.24 DAT's, CRC
DUPLEX	FULL or HALF, HALF(DCD IGNORED)	FULL or HALF	DUPLEX (concerns modem signals between MVI and the modem) (FULL, HALF, HALF(DCD IGNORED)) For dial-up lines only full duplex is supported. Half duplex is provided for multi-drop or 2-wire private lines
DIAL	0/1	0	DIALING 1= enabled. For dial-up lines 0= disabled. For dedicated lines (private/leased)
SPEED	150, 300, 600, 1200, 2400, 4800 or 9600 19200 only for RCOM with MVI	1200/9600	Transmission SPEED of communication in bits/s 150, 300, 600, 1200, 2400, 4800 or 9600 19200 may only be used on a CI532V01 (1200= standard for MP 40 slaves)
CHLEN	7-8	8	CHARACTER LENGTH in bits; only 8 may be used for RCOM
STOPBITS	1, 1.5, 2	1	STOP BITS
PARITY	NONE, ODD, EVEN	ODD	PARITY (ODD= standard for MP 40 slaves) (NONE, ODD, EVEN)
LINESTAB	0-15	2 for half duplex, 1 for full duplex	LINE STABILIZATION time. (Pre idle time) The number of characters times to allow the carrier wave to stabilize before transmission of the first character. If half duplex is used, a check of DCD will be made by the send routine before activating RTS. If DCD is activated, in half duplex mode a delay up to this number of characters or until DCD is deactivated will be made. Restrictions: Own pre idle time >= (opposite side) post idle time. See also figure below. For PROTOTYPE = 1 and DIAL = 1 LINESTAB = 6 is recommended.

Table 3-12. Description of the DB element MVICHAN, communication part (Continued)

Terminal	Allowed Value	Recommended Value	Description
CARRDEL	0-15	1 for half duplex, 0 for full duplex.	CARR ier DEL ay (Post idle time) Number of characters to wait after the transmission of the last character before deactivating RTS. This delay is used to avoid destruction of the last character in the message, due to lost carrier. See also figure below.
MAXRETR	0-20	2 4 (MP 40)	MAX imum number or RETR ansmissions before line is considered broken
CHARTOUT	0-15	2	CHAR acter TimeOUT (in number of characters)
TURNTIME	0-20000 ms in steps of 1 ms for RCOM using MVI 10-20000 ms in steps of 10 ms for RCOM using SW driver	200*9600 / SPEED	TURN around TIME . Time in ms to wait as from the last character in the command until the first character in the reply i.e. the time-out time, the master waits for a response from the slave. Note that this time is dependent on the pre idle time and post idle time in the slave and must be adjusted accordingly. You must also include delays that may occur in the slave units. See also figure below.
UARTTOUT	0-15	2 for half duplex, 1 for full duplex.	UART transmission TimeOUT .Maximum number of characters the controller waits for a DCD before aborting the transmission.
POLLCYCL	0-255 s	96000/SPEED(s)	maximum time between two POLL ing CYCL es in seconds.
CTRLERR	B(r)		Indicating any ERR ors in the modem ConTRoL signals CTS, DCD, DSR, RI
DSR	B(r)		modem signal " Data Set Ready " (DSR)
DCD	B(r)		modem signal " Data Carrier Detect " (DCD)
CTS	B(r)		modem signal " Clear To Send " (CTS)
RI	B(r)		modem signal " Ring Indicator " (RI)

Terminals Parameter part of the DB element MVICHAN

Table 3-13. Description of the DB element MVICHAN, parameter part

Terminal	Allowed Values	Recommended Value	Description
			PARAM1 - PARAM8 are protocol dependent parameters.
PARAM1	1-(IL)	1 for multidrop and point to point 3 for dial-up lines	No. of preambles. See Section describing Data Flow on the RCOM Link.
PARAM2	0-(IL)	30 s	Hang-up time for dial-up lines. Time in seconds before hang-up in case no data is transmitted. This time is also used for dial-up waiting for answer.
PARAM3	0-(IL)	5 s	Disconnect time for dial-up lines. Hang-up time in seconds. The time DTR is deactivated during hang-up
PARAM4	-1 - (IL)	3, (-1)	Max. no. of polls per cycle and slave. Is set to -1 if polling until the event queue in the slave (MP 40) is empty is desired.
PARAM5	0-4	2 for private lines 3 for dial-up lines 0,1,3,4 for MP 40	Clock setting mode (used only for MASTER=1 0 = clock synchronization only on execute command from application (Clock synchronization command) 1 = cyclic clock synchronization Cycle time specified in PARAM6. Only for private lines. 2 = cyclic clock synch. and after restart of a slave node. Cycle time specified in PARAM6. Only for private lines. 3 = clock synchronization after connect of a dial-up line. 4 = clock synchronization before hang-up of a dial-up line. Caution: Dial up of slave with clock synchronization must be executed at every 4000s to guarantee proper time synchronization.
PARAM6	0-(IL)	120s or less.	Protocol dependent parameter for RCOM: Master mode: In case of clock setting modes (PARAM 5) 1 and 2: Cycle time of clock setting. Caution: Do not use more than 4000s to guarantee proper time synchronization. Slave mode: Interval between time synchronization from master.

Table 3-13. Description of the DB element MVICHAN, parameter part (Continued)

Terminal	Allowed Values	Recommended Value	Description
PARAM7	0-(IL)	2	Max. no. of recalls before trying with next phone number. Depends on national Post requirements.Limit for German Post 12 recalls with delay 60 s (PARAM3)between the dial tries. or 2 recalls with delay 5 s (PARAM3). Some modems are allowed to have unlimited recalls with delay 30 s (PARAM3).
PARAM8	0-(IL)	10s	Poll data reception time-out in seconds only for MASTER=1. Used for hang-up in master. This time-out relates to bit 14 in the RTU status 1

Some recommendations for using the half duplex mode:

LINESTAB (pre idle time)

The number of characters to allow the carrier wave to stabilize before transmission. If half duplex is used, a check of DCD will be made by the send routine before activating RTS. If DCD is activated, a delay up to this number of characters or until DCD is deactivated will be made. This delay will also always be made in half duplex mode, before the message is transmitted, after the activation of RTS.

Restrictions:

(own) pre idle time >= (opposite side) post idle time

CARRDEL (post idle time)

Number of characters to wait after transmission of the last character before deactivating

RTS. This delay is used to avoid destruction of the last character in the message, due to lost carrier.

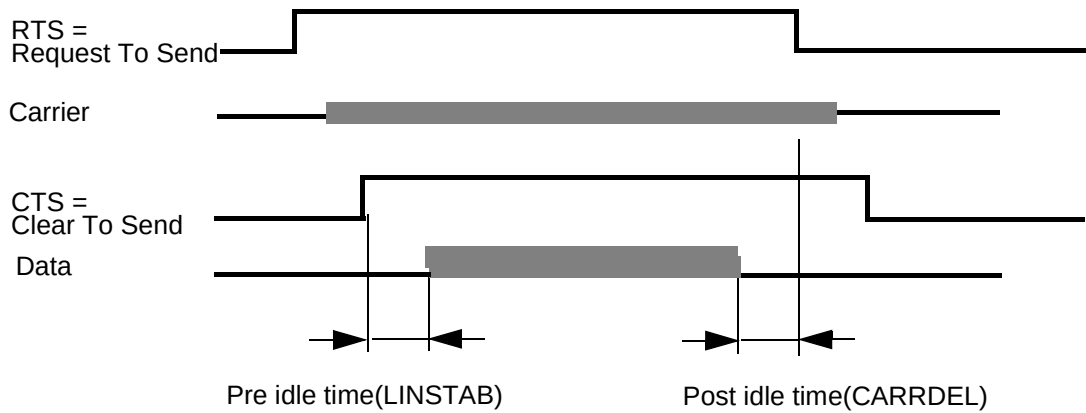


Figure 3-16. Line stabilization time and carrier delay

TURNTIME Adjustment:

Time in milliseconds to wait as from the last character in the command until the first character in the reply i.e. the time-out time, the master waits for a response from the slave. This time is dependent on the times defined in the slave and must be adjusted accordingly. You must also include delays that may occur in the slave units.

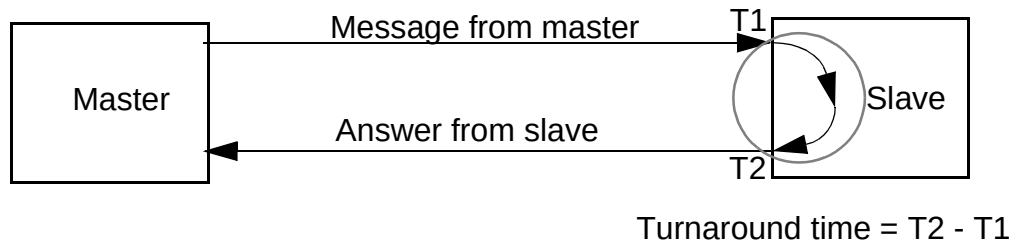


Figure 3-17. Turnaround time.

3.8.4 DB Element for Node Configuration and Status MVINODE

Each slave node included into a MVI network link is represented by a DB element MVINODE on the master. On the slave the master node must be defined.

One DB element MVINODE specifies for a MVI channel configured:

- in **master mode**
 - one slave node connected to the MVI channel
 - the status words 1-3 for this slave node
 - one phone number and one dial string for this slave node (optional)
- in **slave mode**
 - the own status in status word 1
 - up to 4 phone numbers and dial strings for the master(optional)

The phone numbers are used only when the master and the slaves are connected via dial-up lines. In this case at the corresponding MVICHAN the DIAL terminal must be 1.

At the slave the master phone number is used in case of alarm to dial-up the master.

For redundancy up to 4 phone numbers for the master can be specified.

The layout of the DB element MVINODE is shown in the figure below:

DB Element MVINODE

Call name: MVINODE
Element type: MVINODE
Item designation: MVNx

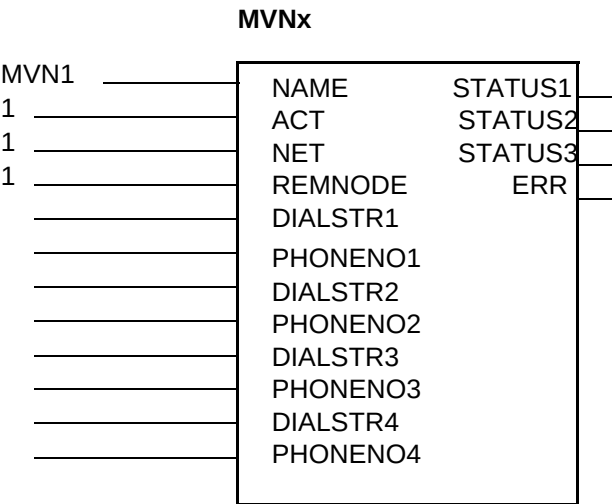


Figure 3-18. Example of a DB element MVINODE

The Terminals of the DB element MVINODE are explained in the table below.

Table 3-14. Description of the **DB element MVINODE**

Terminal	Allowed Values	Recommended Value	Description
NAME	max. 20 characters	MVNx	Unique module NAME
ACT	0/1	1	The DB element is ACTIVE 0 = The element is spare. 1 = The element is active.
REMNODE	(1-254)	1	REMOte NODE number in master mode: node number of slave in slave mode: node number of master
NET	(1-9)	1	NET work number of remote node
DIALSTR1	max. 20 characters	ATDT or ATDP	DIAL STR ing 1 for modem (Hayes commands) e.g. ATDT = Tone dialling ATDP = Pulse dialling
PHONENO1	max. 20 characters		PHONE number 1 (max. 20 characters) for remote node master/slave including area number and including Hayes commands for wait for dial tones etc.
DIALSTR2	max. 20 characters	ATDT or ATDP	DIAL STR ing 2 for modem (max. 20 characters) (see above)
PHONENO2	max. 20 characters		PHONE number2 for remote node master/slave (see above) including area number
DIALSTR3	max. 20 characters	ATDT or ATDP	DIAL STR ing 3 for modem (max. 20 characters) (see above)
PHONENO3	max. 20 characters		PHONE number3 for remote node master/slave (see above) including area number
DIALSTR4	max. 20 characters	ATDT or ATDP	DIAL STR ing 4 for modem (max. 20 characters) (see above)
PHONENO4	max. 20 characters		PHONE number4 for remote node master/slave (see above) including area number
STATUS1	IL(r)		MVI STATUS word 1 (RCOM)Status of the remote node
STATUS2	IL(r)		MVI STATUS word 2 (RCOM)Status of the remote node

Table 3-14. Description of the DB element MVINODE (Continued)

Terminal	Allowed Values	Recommended Value	Description
STATUS3	IL(r)		MVI STATUS word 3 (RCOM)Status of the remote node
ERR	B(r)		ERR or. ERR is set when the reading of a status word failed.

MVI STATUS 1, 2 and 3 (RTU STATUS)

The status of every RCOM slave (RTU) is accessible by a PC program at the terminals STATUS1, STATUS2, STATUS3 of the corresponding MVINODE.

The status information is used for error indication, supervision and exception handling in PC programs. Status information can be used for enabling flow control (e.g. in case of dial-up lines) besides error indication and supervision.

Examples: LINK STATUS is used for supervision of connection of nodes via private lines
LINE STATUS is used for supervision of dial-up lines
CALL FAILED is used for supervision of the establishing of dial-up lines
POLLING BLOCKED for supervision of data (event) polling.
... etc. see Table 3-15.

The status words are of format IL (integer long). The 32 bit values are extracted using a CONV-IB PC element in the PC program. (See Figure 3-19).

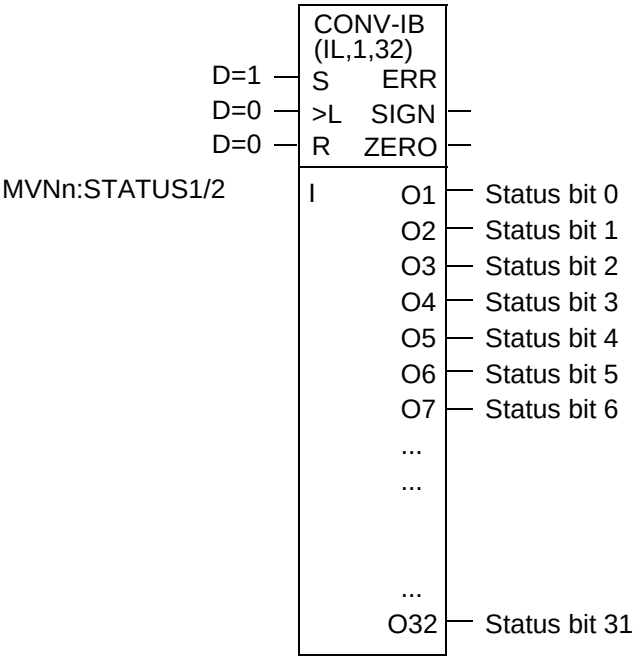


Figure 3-19. Example of a PC element CONV-IB used to get RTU status values.

Status1

Contains information required for supervision and flow control among other things. When the RCOM channel operates in master mode, the status 1 bits 16-31 describe the RCSW (RCOM Status Word) of the corresponding slave node. When the RCOM channel operates in slave mode, the bits 16-31 describe the own RCSW. (RTU corresponds to remote slave node.)

Table 3-15. Status1

Status 1	Description	Valid modes
Bit 0	Link status The corresponding RTU reachable, see Figure 3-17. Set to '1' when the remote node is reachable. Set to '0' when contact with remote node is lost (including restart of the RCOM channel). The Link status is normally <u>not</u> set to '0' when the telephone line is disconnected with the Telephone command (See line status below). The master considers the contact lost after max number of retransmissions of a signal without an answer. The slave node considers the contact lost when the times between messages from the master exceed the poll cycle time.	Slave and Master
Bit 1	Line status Set to '1' when the telephone line is connected. Set to '0' when the telephone line is disconnected (also when 'Link status' is set to '0').	Slave and Master (only in telephone mode)
Bit 2	Dialling-up is performed Set to '1' when dial-up is performed. Set to '0' when telephone line is up or when node fails to dial up the opposite node. See bit 13.	Slave and Master
Bit 3	Illegal MS number received Set to '1' when illegal MVB REGADDR is received from an RTU. Set to '0' when receiving a valid MVB.	Slave and Master
Bit 4	Illegal function code received Set to '1' when illegal functions code is received from an RTU. Set to '0' when receiving valid MVB	Slave and Master
Bit 5	Ready for Message Set to '1' when no command is pending, from the application to the RTU. Set to '0' when a command is pending, from the application to the RTU.	Slave and Master
Bit 6	Started Set to '1' when the own node has started. Set to '0' in a slave node after transmission of system message 'Restarted' to the master. Always set to '1' after start-up in a master node.	Slave and Master
Bit 7	Time in Status 3 is valid Set to '1' when a poll answer with time stamped event from a slave node is received. Set to '0' at restart of the RCOM channel.	Master

Table 3-15. Status1 (Continued)

Status 1	Description	Valid modes
Bit 8	Application part not ready in the slave node Set to '1' when master receives an answer with the function code 'Application part not ready', i.e., MVB not built in slave node, slave not Normalized, etc. Set to '0' when master receives a valid answer from the slave node.	Master
Bit 9	Uncertain time Set to '1' when master receives a time-stamped event (poll answer) with the function code for Uncertain time. The function code is normally not set in a slave node. Set to '0' when master receives a time-stamped event without this function code.	Master
Bit 10	Unknown system message Set to '1' when the master receives a system message that cannot be mapped to Status2 (code <0 or >31). Set to '0' at restart of the RCOM channel. See Status2 below for description of valid system messages.	Master
Bit 11	Poll time-out Set to '1' when the poll supervision timer expires, i.e., the master is unable to send a poll request message to slave node within the specified time-out time. This is caused by too many command MVB's. <u>The slave node also resets link status bit when the poll supervision expires.</u> Set to '0' when polling is performed.	Slave and Master (not in telephone mode)
Bit 12	Not used	Not used
Bit 13	Call failed (dial-up) Set to '1' when node fails to dial up the opposite node. Set to '0' when the dial-up is successful.	Slave and Master (only in telephone mode)
Bit 14	Poll data reception time-out Set to '1' if no MVB is received by polling within the time-out specified by PARAM8 at DB element MVICHAN. Set to '0' when a MVB is received by polling without time-out.	Master (only in telephone mode)
Bit 15	Not used	Not used
Bit 16 Bit 17	Slave mode Not used in AC 110 Both values constant 1 in case of MP 40	Not used Slave and Master (See note below)

Table 3-15. Status1 (Continued)

Status 1	Description	Valid modes
Bit 18	Watch dog alarm Set to '1' when the watchdog alarm is set. Set to '0' when the node receives Cold Start or Warm Start.	Not used
Bit 19	Illegal command	Not used
Bit 20	Not used	Not used
Bit 21	Not used	Not used
Bit 22	Not used	Not used
Bit 23	Not used	Not used
Bit 24	Not used	Not used
Bit 25	Sequence mark, read	Slave and Master (See note below)
Bit 26	Sequence mark, write	Slave and Master (See note below)
Bit 27	Polling blocked Set to '1' when the slave node must receive a Normalization command Set to '0' when the user part in the slave node is Normalized	Slave and Master (See note below)
Bit 28	Not used	Not used
Bit 29	Not used	Not used
Bit 30	Not used	Not used
Bit 31	Not used	Not used

NOTE

Status 1 bits 16-31 describe the **RCSW (RCOM Status Word)** of the corresponding slave node.
When the node operates in slave mode, the bits 16-31 describe the own status RCSW.

Status2:

Contains information on system messages from the slave when **the node itself is the master**.
Status2 is reset at Cold Start, Warm Start and Normalization

Table 3-16. Status2

Status2	Description	Valid modes
Bit 0	Slave node restarted	Master
Bit 1	I/O unit error	Master. Received only from MP 40.
Bit 2	Check sum error, application	Master.
Bit 3	Check sum error, system 1	Not used
Bit 4	Check sum error, system 2	Not used
Bit 5	Check sum error, EEPROM	Not used
Bit 6	ADC error	Master. Received only from MP 40.
Bit 7	Event queue full In AC 110 and AC 55: At least one queue for time-tagged events is 80 % filled. In MP 40: The queue for event-transmitted data is 80 % filled.	Master. Received only from AC 110, AC 55 and MP 100.
Bit 8	Local parameter change	Master. Received only from MP 40.
Bit 9	Power failure	Master. Received only from AC 110 and AC 55.
Bit 10	I/O module error	Master. Received only from AC 110 and AC 55.
Bit 11	Processor exception The processor has executed an exception (zero divide, address error, etc.)	Master. Received only from AC 110 and AC 55.
Bit 12	System overload	Master. Received only from AC 110 and AC 55.
Bit 13	Battery not OK	Master. Received only from AC 110 and AC 55.
Bit 14, 15	Not used	Not used

Table 3-16. Status2

Status2	Description	Valid modes
Bit 16	Watch dog alarm System software stalled	Master. Received only from AC 110 and AC 55.
Bit 17	New status word	Not used.
Bit 18	Compilation error	Not used.
Bit 19	Local parameter error	Master. Received only from MP 40.
Bit 20	Parameter error	Not used.
Bit 21 -31	Not used	Not used.

Status3 (integer long):

Time tag of last MVB or system message received by polling from a slave. The time is stored in the format: number of 0.1 ms since midnight.

The time in Status3 can be used together with the changed status of the updated MVB to activate Application a PC program for reporting of events from MP 40 slaves.

For event handling please refer to *Advant Controller 110 Configuration and Programming*, Chapter: *Event Handling*.

3.8.5 DB Element for Data Transfer and Command MVB

This chapter describes the data transfer MVB DB element, the chapter following describes the command MVB's. The data transfer MVB's contain the data to be transferred via RCOM lines.

- A data transfer MVB references to a collection of up to 128 DAT's of any type.
- For RCOM only 8 DAT's are used. (MVICHAN, PROTOTYPE = 1)
- For RCOM Extended 24 DAT's are optional. (MVICHAN, PROTOTYPE = 2).

The DB element MVB specifies one MVI Data Block. An MVB configures either data transmission or commands for the MVI protocol handler (in our case the RCOM protocol handler). The layout of the DB element MVB is shown in Figure 3-20.

Call name: MVB
Element type: MVI Data Block
Item designation: MVBx

Base Part

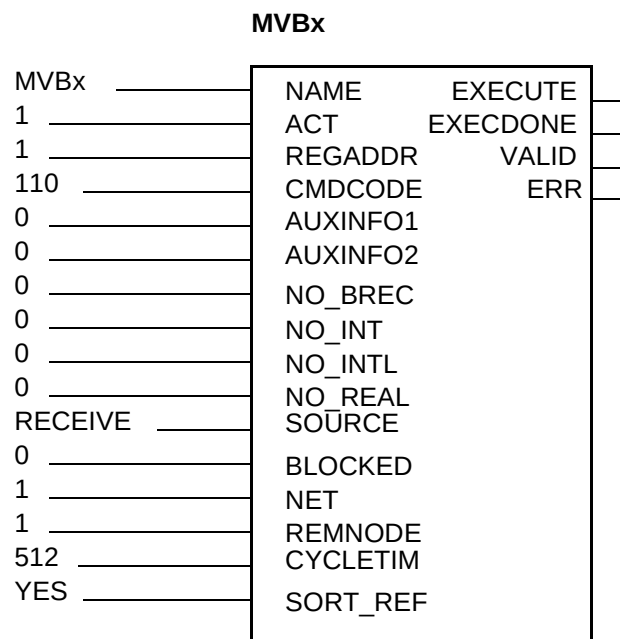
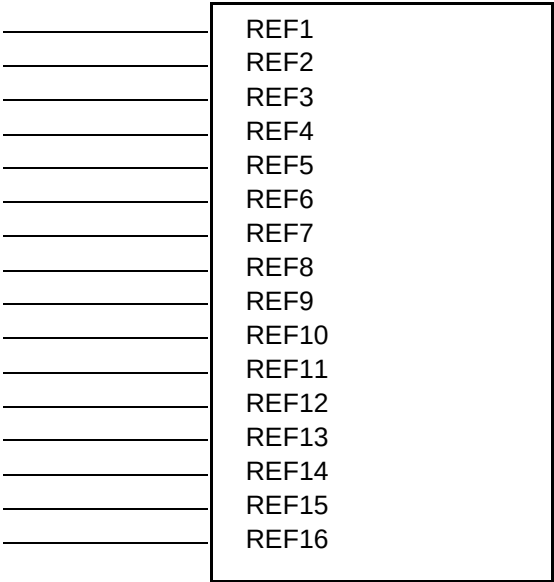


Figure 3-20. Example of a DB element MVB, base part

Reference Part

Value references 1-16



Value references 113-128

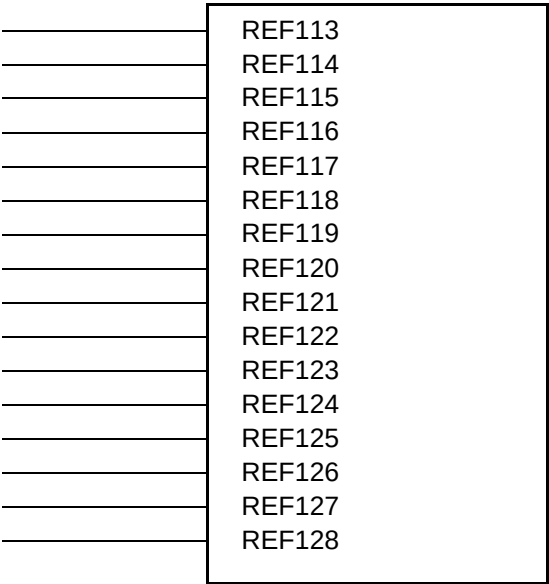


Figure 3-21. Example of a DB element MVB, value references

Table 3-17. Description of the DB element MVB, base part

Terminal	Allowed Values	Recommended Value	Description
NAME	(max.12 characters)	MVBx	Unique module NAME
ACT	0/1	1	Element is ACT ive 0 = The element is spare, 1 = The element is active
REGADDR	1-240		REG ister start ADDR ess in RCOM identity(IDENT) of the MVB.
CMDCODE	3,4,110,210,301,302,305,308		CoMmanD CODE to be executed for RCOM: 3, 4, 110, 210, 301, 302, 305, 308
AUXINFO1	0/1/-1		AUX iliary INFORM ation 1 , = 0 for CMDCODE 4, 110, 210, 301, 308 =-1 for CMDCODE 302, 305 = 0/1 for CMDCODE 3
AUXINFO2	0/-1		AUX iliary INFORM ation 2 , =-1 for CMDCODE 305, else =0.
NO_BREC	0-8/24		Number of Boolean REC ords DAT(B) (protocol dependent) (0-8) for RCOM, (0-24) for RCOM Extended
NO_INT	0-8/24		Number of INT eger records DAT(I) (prot. dependent) (0-8) for RCOM, (0-24) for RCOM Extended
NO_INTL	0-8/24		Number of INT eger Long records DAT(IL) (prot. dependent) (0-8) for RCOM, (0-24) for RCOM Extended
NO_REAL	0-8/24		Number of REAL records DAT(R) (prot. dependent) (0-8) for RCOM, (0-24) for RCOM Extended
SOURCE	RECEIVE/SEND	R/S	SOURCE . Direction of the data transmission RECEIVE = Receiving, SEND = Sending
BLOCKED	0,1		BLOCKED . <u>Cyclic execution</u> of the specified RCOM command is 0 = not BLOCKED, 1 = BLOCKED. The cycle time is defined by the terminal CYCLETIM. For MVB's with SOURCE=RECEIVE: BLOCKED=1 blocks the reception of MVB's by <u>polling</u> .
NET	1-9	1	NET work number of slave or master with REMNODE. The network number must be the same as in the corresponding MVINODE.

Table 3-17. Description of the DB element MVB, base part (Continued)

Terminal	Allowed Values	Recommended Value	Description
REMNODE	1-255	1	REMote NODE number Master mode: node number of slave (255-> Global command) Slave mode: node number of master REMNODE must be the same as in the corresponding MVINODE
CYCLETIME	(0, 4, 8 ... 512 ... 32768)	512	CYCLE TIME. 1. Defines the cycle time of the protocol command execution for BLOCKED = 0 in multiples of 100ms. (0 -> no <u>cyclic</u> execution). 2. For MVB's with SOURCE=RECEIVE: Supervision time for system reset of the terminal VALID (see terminal VALID).
SORT_REF	NO/YES	YES NO (MP 40)	SORT REFERENCES YES = references sorted in the order B, I, IL, R
EXECUTE	B(r/w)		EXECUTE command. 1. Invokes the single execution of the specified protocol handler command when changing from 0 to 1.(The completion of the command execution is indicated by the terminal EXECDONE and the result status by the terminals ERR and VALID.) 2. Setting EXECUTE to 0 the terminal EXECDONE is reset.
EXECDONE	B(r/w)		Command EXECUTION is DONE . 1 = The command execution requested by EXECUTE is completed. (The result status is indicated by the terminals ERR and VALID.). 0 = MVB is ready for next command execution.
VALID	B(r/w)		VALID 1 after successful execution of the RCOM command. For MVB's with SOURCE=RECEIVE: The terminal will be reset by system if no DAT's are received within the supervision time of 3*CYCLETIM (for CYCLETIM>0 and EXECUTE=0).
ERR	B(r)		ERROR ERR is set if an error occurred

Table 3-18. Description of the DB element MVB, value references

Terminal	Parameter Name	Recommended Value	Description
REF1			REF erence: Name of connected DAT element
REF2			REF erence: Name of connected DAT element
REF3			REF erence: Name of connected DAT element
REF4			REF erence: Name of connected DAT element
REF5			REF erence: Name of connected DAT element
REF6			REF erence: Name of connected DAT element
REF7			REF erence: Name of connected DAT element
REF8			REF erence: Name of connected DAT element Max. 8 REF for RCOM (not RCOM Extended.)
....			
REF24			REF erence: Name of connected DAT element Max.24 REF for RCOM Extended
....		--	
REF128		--	REF erence: Name of connected DAT element Not used for RCOM

NOTE

[REGADDR,NET;NODE,SOURCE,CMDCODE] must be unique in the control netw. (1-9)

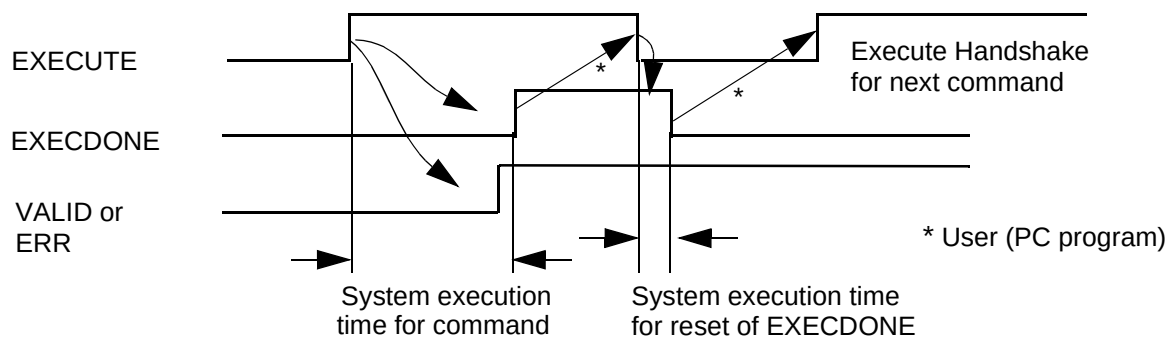


Figure 3-22. Handshake between EXECUTE, EXECDONE, VALID, and ERR

3.8.6 DB Element MVB for Data Transfer

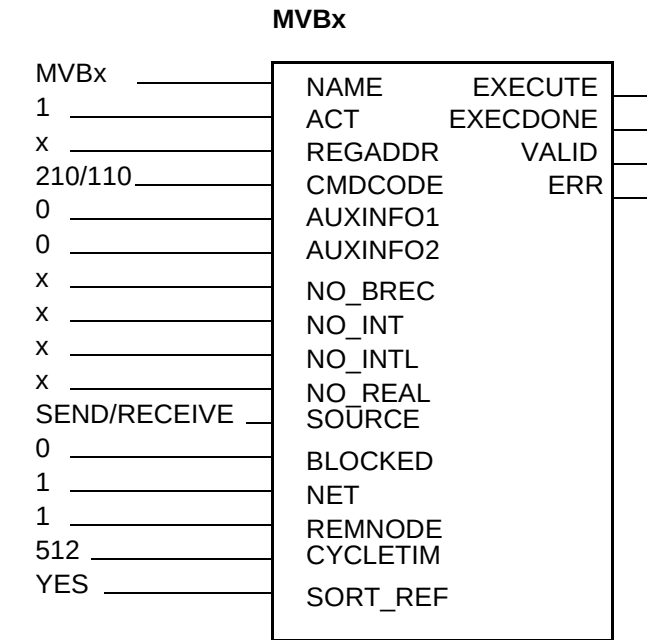
MVB's are used to transfer data between a master and slave node. A pair of MVB's with the same identity (terminal REGADDR) is created on each node. The sending MVB is configured with terminals SOURCE=SEND, CMDCODE=210 and the receiving with SOURCE=RECEIVE, CMDCODE=110. Both MVB's must have the same number, type and reference order of DAT's. See figure below.

Up to 8 (or 24) DAT's can be referenced by one MVB using RCOM (or RCOM Extended).

Setting the terminal BLOCKED of both MVB's to 0 the DAT's of the sending MVB on one node are cyclically transmitted to the DAT's of the MVB on the other node. The cycle time is configured by the terminal CYCLETIM which have to be the same value at both MVB. Using the terminal EXECUTE data can be transferred in a single shot manner. The terminal EXECUTE is controlled by a PC program.

PC program for flow control in slave mode is only needed if a RCOM channel is used with polled data transmission to the master. PC program is always necessary if a RCOM channel is used in master mode.

Connecting AC 110 with a MP 200/1, MP 40 or AC 400 series of controllers, DB elements MS are used instead of MVB. In this case the terminal IDENT of the MS corresponds to the terminal REGADDR of the MVB.



Value references 1-16

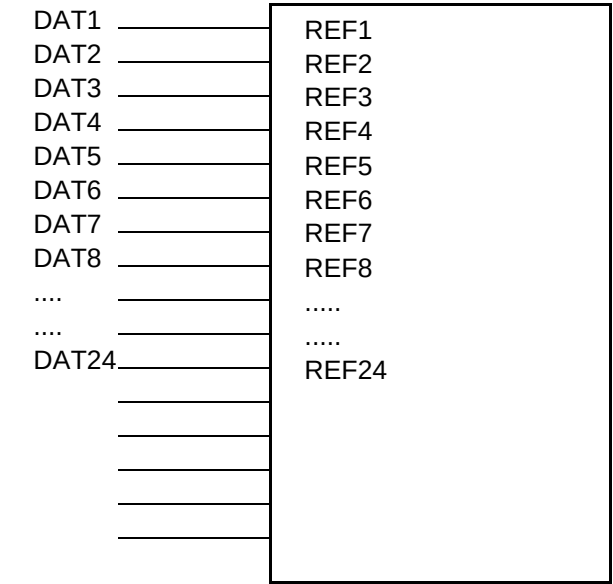


Figure 3-23. Example of a Data MVB for Data transfer

3.8.6.1 Data Transfer from Master to Slave

To transfer data from a master to a slave the MVB on the master is configured with command code 210 ('write') and the corresponding MVB on the slave with command code 110 ('read').

Executing the MVB on the master a RCOM command 'write' with the DAT's of the executed MVB is sent to the slave. The sent DAT's are stored in the MVB with same identity (terminal REGADDR) on the slave.

The MVB's are configured in following manner:

Master node:

Table 3-19. Configuration of the DB element MVB for data transfer on the master node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM represents the identity (IDENT) of the MVI Data Block.
CMDCODE	210	Command code 'write'. Transmits the DAT's of this MVB to the corresponding MVB (same REGADDR) on the specified slave node (terminals NET, REMNODE)
AUXINFO1	0	Must be 0.
AUXINFO2	0	Must be 0.
NO_BREC	(0-8/24)	Number of boolean DAT's referenced by the MVI Data Block
NO_INT	(0-8/24)	Number of integer DAT's referenced by the MVI Data Block
NO_INTL	(0-8/24)	Number of long integer DAT's referenced by the MVI Data Block
NO_REAL	(0-8/24)	Number of real DAT's referenced by the MVI Data Block
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Cyclic data transmission deblocked Cyclic data transmission blocked
NET	1-9	Network number of the line
REMNODE	1-254	Node number of the remote receiving RTU
CYCLETIM		Defines the cycle time of the MVB transmission (only for BLOCKED =0). Ensure that the receiving MVB on the slave node is configured with the same CYCLETIM value.
SORT_REF	YES/NO	All DAT references are sorted in the order B, I, IL, R

Table 3-19. Configuration of the **DB element MVB for data transfer** on the master node (Continued)

Terminal	Value	Description
EXECUTE		When changing from 0 to 1 the transmission of the MVB is requested. The completion of the MVB transmission is indicated by the terminal EXECDONE. Setting the terminal EXECUTE to 0 the terminal EXECDONE is reset.
EXECDONE	0	1 after MVB transmission if requested by terminal EXECUTE. The terminal ERR indicates whether the MVB transmission failed or not.
VALID		1 after successful transmission of the MVB.
ERR		1 in case of error in transmission of the MVB. In this case the terminal is reset after the next successful transmission of the MVB.
REF1-REF8 REF1-REF24		Names of DAT's to be sent or received. Max. 8 DAT's for RCOM, max. 24 DAT's for RCOM Extended

Slave node:

Table 3-20. Configuration of the **DB element MVB for data transfer** on the slave node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM it represents the identity (IDENT) of the MVI Data Block.
CMDCODE	110	Command code 'read'. Receives the DAT's from the corresponding MVB (same REGADDR) from the specified master node (terminals NET, REMNODE)
AUXINFO1	0	Not used.
AUXINFO2	0	Not used.
NO_BREC	(0-8/24)	Number of boolean DAT's referenced by the MVI Data Block
NO_INT	(0-8/24)	Number of integer DAT's referenced by the MVI Data Block
NO_INTL	(0-8/24)	Number of long integer DAT's referenced by the MVI Data Block
NO_REAL	(0-8/24)	Number of real DAT's referenced by the MVI Data Block
SOURCE	RECEIVE	RECEIVE= Receiving

Table 3-20. Configuration of the **DB element MVB for data transfer** on the slave node (Continued)

Terminal	Value	Description
BLOCKED	0 1	The DAT's of this MVB are updated when a MVB is received from the master node The DAT's of this MVB are not updated when a MVB is received from the master.
NET	1-9	Network number of the RCOM line
REMNODE	1-254	Node number of the PLC/RTU the MVB is received from.
CYCLETIM		Supervision time for reset of the VALID terminal (see terminal VALID)
SORT_REF	YES/NO	All DAT references are sorted in the order B, I, IL, R
EXECUTE		Not used
EXECDONE	0	Not used
VALID		1 after successful transmission of the MVB. The terminal is reset if no DAT's have been received from the master node within the supervision time of 3*CYCLETIM (only for CYCLETIM>0)
ERR		1 in case of error in reception of the MVB. In this case the terminal is reset after the next successful reception of the MVB.
REF1-REF8 REF1-REF24		Names of DAT's storing the received data. Max. 8 DAT's for RCOM, max. 24 DAT's for RCOM Extended

3.8.6.2 Data Transfer from Slave to Master

To transfer data from a master to a slave the MVB on the master is configured with command code 110 ('read') and the corresponding MVB on the slave with command code 210 ('write'). Up to 8 or 24 DAT's depending on the protocol type can be received by one MVB from the slave.

- *By read command.* Executing the MVB on the master a RCOM command 'read' is sent to the slave. The replied DAT's from the MVB on the slave with the same identity (terminal REGADDR) are stored in the executed MVB on the master.
- *By polling.* Executing the MVB on the slave the DAT's of the MVB are stored in the event queue of the RCOM channel and sent to the master by polling response. On the master the received DAT's are stored in the MVB with the same identity (terminal REGADDR).

If the protocol type is RCOM (terminal PROTOTYPE=1 at MVICHAN) then only 7 DAT's are allowed.

In both cases the MVB's are configured in following manner:

Master node:

Table 3-21. Configuration of the DB element MVB for data transfer on the master node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM it represents the identity (IDENT) of the MVI Data Block.
CMDCODE	110	Command code 'read'. Reads the DAT's of the corresponding MVB (same REGADDR) from the specified slave node (terminals NET, REMNODE) In addition the DAT's of the MVB can be received by polling
AUXINFO1	0	Must be 0.
AUXINFO2	0	Must be 0.
NO_BREC	0-8/24	Number of boolean DAT's referenced by the MVI Data Block
NO_INT	0-8/24	Number of integer DAT's referenced by the MVI Data Block
NO_INTL	0-8/24	Number of long integer DAT's referenced by the MVI Data Block
NO_REAL	0-8/24	Number of real DAT's referenced by the MVI Data Block
SOURCE	RECEIVE	RECEIVE = Receiving
BLOCKED	0 1	Cyclic execution of read command is deblocked Cyclic execution of read command is blocked
NET	1-9	Network number of the RCOM line
REMNODE	1-254	Node number of the remote PLC/RTU the MVB is read from.
CYCLETIM		Defines the cycle time of the read command execution (only for BLOCKED =0) and the supervision time for reset of the VALID terminal.
SORT_REF	YES/NO	All DAT references are sorted in the order B, I, IL, R
EXECUTE		When changing from 0 to 1 the read command is executed. EXECDONE indicates the completion of the command. Setting the terminal EXECUTE to 0 the terminal EXECDONE is reset.
EXECDONE	0	1 after the read command has been completed. The terminal ERR indicates whether an error has occurred or not.
VALID		1 after successful reception of the MVB. If the MVB has been received by read command the terminal is reset by system if no DAT's have been received from the master node within the supervision time of 3*CYCLETIM (only for CYCLETIM>0 and EXECUTE=0)

Table 3-21. Configuration of the **DB element MVB for data transfer** on the master node (Continued)

Terminal	Value	Description
ERR		1 in case of error. In this case the terminal is reset after the next successful reception of the MVB from the slave node.
REF1-REF8(24)		Names of DAT's to be sent or received. Max. 8 (24) DAT's for RCOM (Extended).

Slave node:

Table 3-22. Configuration of the **DB element MVB for data transfer** on the slave node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM it represents the identity (IDENT) of the MVI Data Block.
CMDCODE	210	Command code 'write'. The transmission of the DAT's of this MVB to the corresponding MVB (same REGADDR) on the specified master node (NET, REMNODE) is requested. Note: The MVB is transmitted to the master node: - when the RCOM command 'read' for this MVB (REGADDR) is received from the master node providing the terminal Blocked=0 on the slave or when a polling request is received from the master node providing the terminal EXECUTE on the slave node has been changed from 0 to 1 before.
AUXINFO1	0	Must be 0.
AUXINFO2	0	Must be 0.
NO_BREC	(0-8/24)	Number of boolean DAT's referenced by the MVI Data Block
NO_INT	(0-8/24)	Number of integer DAT's referenced by the MVI Data Block
NO_INTL	(0-8/24)	Number of long integer DAT's referenced by the MVI Data Block
NO_REAL	(0-8/24)	Number of real DAT's referenced by the MVI Data Block
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Cyclic data transmission deblocked Cyclic data transmission blocked
NET	1-9	Network number of the line
REMNODE	1-254	Node number of the remote receiving RTU

Table 3-22. Configuration of the **DB element MVB for data transfer** on the slave node (Continued)

Terminal	Value	Description
CYCLETIM		Defines the cycle time of the MVB transmission is requested (only for BLOCKED =0)
SORT_REF	YES/NO	All DAT references are sorted in the order B, I, IL, R
EXECUTE		When changing from 0 to 1 the MVB is stored in the event queue of the CI532V01 and its transmission is requested. The completion of the MVB transmission is indicated by the terminal EXECDONE. Setting the terminal EXECUTE to 0 the terminal EXECDONE is reset.
EXECDONE	0	1 after the MVB has been stored in the event queue of the CI532V01 and its transmission has been requested. The terminal ERR indicates whether an error occurred.
VALID		1 after successful transmission of the MVB.
ERR		1 in case of error. In this case the terminal is reset after next successful execution of the RCOM command.
REF1-REF8 REF1-REF24		Names of DAT's to be sent or received. Max. 8 DAT's for RCOM, max. 24 DAT's for RCOM Extended.

3.8.7 DB Element MVB for Commands

This chapter describes the Command MVB's used for control of slaves. The Command MVB's are only defined in the RCOM master node, except for the Telephone Command MVB's.

The execution of any RCOM command for control of slaves is programmed by a DB element MVB. The command code is specified at the terminal CMDCODE. Several commands require auxiliary information (command parameters) which are specified by the terminals AUXINFO1 and AUXINFO2. For every command code the value of the MVB terminal SOURCE is 'SEND.

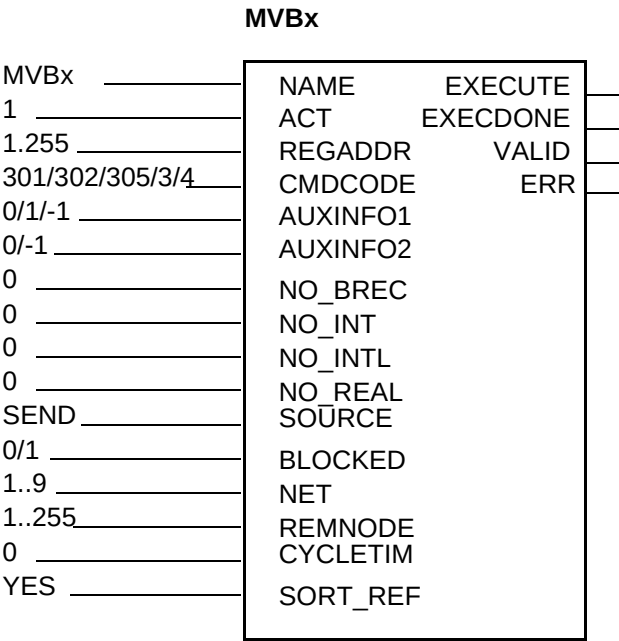
The terminal CMDCODE can have following values for RCOM

Table 3-23. Command codes in master mode

Command Code	RCOM command
301	cold start
302	warm start
305	normalization
308	clock setting
3	dial-up
4	hang-up

Table 3-24. Command codes in slave mode

Command Code	RCOM command
3	dial-up
4	hang-up



Value references not used

Figure 3-24. Example of a command MVB

There is no partner MVB on the slave for commands

3.8.7.1 Cold Start a Slave

One cold start command MVB for each remote node are necessary for executing cold start commands.

Executing a MVB with command code 'cold start' the RCOM channel transmits the RCOM command 'cold start' to the slave node specified by the terminals NET and REMNODE.

- **Advant Controller 110**

Cold start of a slave means a full system restart including the restart of the RCOM channel module with resetting of the sequence marks as well. The RCOM status word (RCSW) and the RTU status 2 is reset. Executing the cold start command an AC 110 or AC 55 slave deletes pending system messages to the master. System messages are not blocked for polling by the master. All MVB's are blocked for event transmission. The events stored in the event queues of the Event Sets (DB elements EVS(S), EVS(T) are cleared. (Event option).

Cold start must be always followed by a normalization of the slave to deblock the event transmission of MVB's and the transmission of time-tagged events between Event Sets (EVS(S) and EVS(T)) (Event option).

- **MasterPiece 40**

MP 40 will be cold started with clearing of the event queue and with resetting of the RCOM sequence marks.

Cold start must be always followed by a normalization of the slave to deblock the event queues with resetting of the RCOM sequence marks.

Table 3-25. Configuration of the **DB element MVB for cold start on the master node**

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM represents the identity (IDENT) of the MVI Data Block.
CMDCODE	301	RCOM command 'cold start'. Requests the transmission of the RCOM command 'cold start' to the slave node.
AUXINFO1	0	Must be 0.
AUXINFO2	0	Must be 0.
NO_BREC	0	Not used.
NO_INT	0	Not used.

Table 3-25. Configuration of the **DB element MVB for cold start** on the master node (Continued)

Terminal	Value	Description
NO_INTL	0	Not used.
NO_REAL	0	Not used.
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Not recommended. Recommended value. (Cyclic data transmission blocked).
NET	1-9	Network number of the RCOM line.
REMNODE	1-254	Node number of the remote PLC/RTU.
CYCLETIM	0	Not used.
SORT_REF	YES	Not used.
EXECUTE		When changing from 0 to 1 the transmission of the RCOM command is requested. The completion of the command transmission is indicated by the terminal EXECDONE.
EXECDONE	0	1 after command transmission if requested by terminal EXECUTE. The terminal ERR indicates whether the command transmission failed or not. EXECDONE is reset by setting the Terminal EXECUTE to 0.
VALID		1 after successful command execution.
ERR		1 in case of error in command transmission. In this case the terminal is reset after the next successful transmission of the RCOM command.
REF1- REF8(24)		Not used.

3.8.7.2 Warm Start/Block a Slave

One warm start command MVB for each remote node can be used for executing warm start commands.

Executing a MVB with command code 'warm start' the RCOM channel transmits the RCOM command 'warm start' to the slave node specified by the terminals NET and REMNODE.

- **AdvantController 110 and AdvantController 55**

Warm start of a slave means that all MVB's are blocked for event transmission. Any MVB waiting in the event queue of the RCOM channel to be transmitted is deleted. In addition, the RCOM status word (RCSW) and the RTU status 2 is reset. Executing the warm start command an AC 110 slave deletes pending system messages to the master. System messages are not blocked for polling by the master.

Warm start must be always followed by a normalization of the slave to deblock the event transmission of MVB's, system messages and the transmission of time-tagged events between Event Sets (EVS(S) and EVS(T)) (Event option).

- **MasterPiece 40**

MP 40 will be warm started with blocking of the event queue and with resetting of the RCOM sequence marks.

Warm start must be always followed by a normalization of the slave to deblock the event queues with resetting of the RCOM sequence marks.

The MVB for the RCOM command "Warm start" is configured on the master in following manner.

Table 3-26. Configuration of the **DB element MVB for warm start** on the master node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM represents the identity (IDENT) of the MVI Data Block.
CMDCODE	302	RCOM command 'warm start'.Requests the transmission of the RCOM command 'warm start' to the slave node.
AUXINFO1	-1	Must be -1.
AUXINFO2	0	Must be 0.

Table 3-26. Configuration of the **DB element MVB for warm start** on the master node (Continued)

Terminal	Value	Description
NO_BREC	0	Not used.
NO_INT	0	Not used.
NO_INTL	0	Not used.
NO_REAL	0	Not used.
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Not recommended. Recommended value.(Cyclic data transmission blocked)
NET	1-9	Network number of the RCOM line
REMNODE	1-254	Node number of the remote PLC/RTU
CYCLETIM	0	Not used.
SORT_REF	YES	Not used.
EXECUTE		When changing from 0 to 1 the transmission of the RCOM command is requested. The completion of the command transmission is indicated by the terminal EXECDONE.
EXECDONE	0	1 after command transmission if requested by terminal EXECUTE. The terminal ERR indicates whether the command transmission failed or not. EXECDONE is reset by setting the Terminal EXECUTE to 0.
VALID		1 after successful command execution.
ERR		1 in case of error in command transmission. In this case the terminal is reset after the next successful transmission of the RCOM command.
REF1-REF8(24)		Not used.

3.8.7.3 Normalize/Deblock a Slave

One normalization command MVB for each remote node are necessary for executing normalization commands.

Executing a MVB with command code 'normalization' the RCOM channel transmits the RCOM command 'normalization' to the slave node specified by the terminals NET and REMNODE.

- **AC 110 and AC 55**

Normalization of a slave means that all MVB's are **deblocked** for event transmission. In addition, the RCOM status word (RCSW) and the RTU status 2 are reset.

A slave must be normalized after power-up and after the execution of the RCOM commands 'cold start' and 'warm start'. The bit 27 in RTU status 1 'polling blocked' is set if the slave must be normalized.

- **MP 40**

MP 40 will be normalized with deblocking of the event queue and with resetting of the RCOM sequence marks.

MP 40 must be normalized after power-up and after the execution of the RCOM commands 'cold start' and 'warm start'. The bit 27 in RTU status 1 'polling blocked' is set if MP 40 slave must be normalized.

Table 3-27. Configuration of the **DB element MVB for normalization/deblocking** on the master node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters).
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM represents the identity (IDENT) of the MVI Data Block.
CMDCODE	305	RCOM command 'normalization'. Requests the transmission of the RCOM command 'normalization' to the slave node.
AUXINFO1	-1	Must be -1
AUXINFO2	-1	Must be -1
NO_BREC	0	Not used.
NO_INT	0	Not used.
NO_INTL	0	Not used.
NO_REAL	0	Not used.
SOURCE	SEND	S = Sending

Table 3-27. Configuration of the **DB element MVB for normalization/deblocking** on the master node (Continued)

Terminal	Value	Description
BLOCKED	0 1	Not recommended. Recommended value. (Cyclic data transmission blocked)
NET	1-9	Network number of the RCOM line
REMNODE	1-254	Node number of the remote PLC/RTU
CYCLETIM	0	Not used.
SORT_REF	YES	Not used.
EXECUTE		When changing from 0 to 1 the transmission of the RCOM command is requested. The completion of the command transmission is indicated by the terminal EXECDONE.
EXECDONE	0	1 after command transmission if requested by terminal EXECUTE. The terminal ERR indicates whether the command transmission failed or not. EXECDONE is reset by setting the Terminal EXECUTE to 0.
VALID		1 after successful command execution.
ERR		1 in case of error in command transmission. In this case the terminal is reset after the next successful transmission of the RCOM command.
REF1- REF8(24)		Not used.

3.8.7.4 Clock Synchronization

One MVB for each communication channel may be used in the RCOM master node for execution of the Clock Synchronization function.

Executing the command 'clock synchronization' the RCOM channel transmits the RCOM command 'clock synchronization' including the actual time and date to all slave nodes of the channel.

This command can be executed only by a RCOM channel operating in master mode. It should always be sent as a global command to the slave nodes.

Another way to send clock synchronization to the slave is the configuration of the clock setting mode at the DB element MVICHAN (see terminals PARAM5, PARAM6).

Table 3-28. Configuration of the **DB element MVB for clock synchronization on the master node**

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM represents the identity (IDENT) of the MVI Data Block.
CMDCODE	308	RCOM command 'clock synchronization'. Requests the transmission of the RCOM command 'clock synchronization' to all slave nodes (global command).
AUXINFO1	0	Must be 0.
AUXINFO2	0	Must be 0.
NO_BREC	0	Not used.
NO_INT	0	Not used.
NO_INTL	0	Not used.
NO_REAL	0	Not used.
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Not recommended. Recommended value. (Cyclic data transmission blocked).
NET	1-9	Network number of the RCOM line.
REMNODE	255	Must be 255 because the clock synchronization is sent to all slave nodes.
CYCLETIM	0	Not used.
SORT_REF	YES	Not used.

Table 3-28. Configuration of the **DB element MVB for clock synchronization on the master node** (Continued)

Terminal	Value	Description
EXECUTE		When changing from 0 to 1 the transmission of the RCOM command is requested. The completion of the command transmission is indicated by the terminal EXECDONE.
EXECDONE	0	1 after command transmission if requested by terminal EXECUTE. The terminal ERR indicates whether the command transmission failed or not. EXECDONE is reset by setting the Terminal EXECUTE to 0.
VALID		1 after successful command execution.
ERR		1 in case of error in command transmission. In this case the terminal is reset after the next successful transmission of the clock synchronization.
REF1-REF8(24)		Not used.

3.8.7.5 Telephone Commands

Two telephone command MVB's for each remote node may be used for dial-up the remote node and hang-up of telephone connections.

Generally one dial-up MVB is used on the master to dial-up the slave.

On the slave a dial-up MVB has to be configured for programmed dial-up (optional).

No command MVB has to be configured on the slave for alarm dial-up.

Generally one hang-up MVB is used on the master to disconnect the line.

On the slave a hang up MVB has to be configured for programmed hang-up (optional).

Note that for telephone handling only full duplex is valid.

Dial-up

Executing the command 'dial-up' the RCOM channel requests the connected modem to dial-up the remote node specified by the terminals REMNODE and NET. The dial string and the phone number are taken from the DB element MVINODE with the same terminal values of NET and REMNODE.

Table 3-29. Configuration of the **DB element MVB for dial-up** on the master node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Register address. In RCOM it represents the identity (IDENT) of the MVI Data Block.
CMDCODE	3	RCOM command 'dial-up'. The RCOM channel requests the modem to dial-up the remote node.
AUXINFO1	0 1	Used only in master mode: Requests normalization of communication part and starts polling after acknowledgment from the slave node. Used only in master mode: Requests only normalization of communication part after acknowledgment from the slave node. Polling is commenced after the RCOM command 'Normalization' has been sent to the slave node.
AUXINFO2	0	Must be 0.
NO_BREC	0	Not used.
NO_INT	0	Not used.
NO_INTL	0	Not used.
NO_REAL	0	Not used.
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Not recommended. Recommended value. (Cyclic data transmission blocked).
NET	1-9	Network number of the RCOM line.
REMNODE	1-254	Node number of the remote PLC/RTU.
CYCLETIM	0	Not used.
SORT_REF	YES	Not used.
EXECUTE		When changing from 0 to 1 the transmission of the RCOM command is requested. The completion of the command transmission is indicated by the terminal EXECDONE.
EXECDONE	0	1 after completion of dialling. The terminal ERR indicates whether the dialling failed or not. EXECDONE is reset by setting the Terminal EXECUTE to 0.
VALID		1 after successful command execution.

Table 3-29. Configuration of the **DB element MVB for dial-up** on the master node (Continued)

Terminal	Value	Description
ERR		1 in case of error in dialling. In this case the terminal is reset after the next successful dial-up.
REF1-REF8(24)		Not used.

Hang-up

Executing the command 'hang-up' the RCOM channel requests the modem to go on hook by resetting the DTR signal after hang-up time. The hang-up time can be configured by the terminal PARAM2 at the DB element MVICHAN.

Table 3-30. Configuration of the **DB element MVB for hang-up** on the master node

Terminal	Value	Description
NAME	MVBx	Unique name of the MVI Data Block (max. 12 characters)
ACT	1 0	The element is active The element is spare.
REGADDR	1-240	Not used.
CMDCODE	4	RCOM command 'hang-up'. The RCOM channel requests the modem to go on hook.
AUXINFO1	0	Must be 0.
AUXINFO2	0	Must be 0.
NO_BREC	0	Not used.
NO_INT	0	Not used.
NO_INTL	0	Not used.
NO_REAL	0	Not used.
SOURCE	SEND	SEND = Sending
BLOCKED	0 1	Not recommended. Recommended value. (Cyclic data transmission blocked).
NET	1-9	Network number of the RCOM line.
REMNODE	1-254	Node number of the remote PLC/RTU.
CYCLETIM	0	Not used.
SORT_REF	YES	Not used.

Table 3-30. Configuration of the DB element MVB for hang-up on the master node (Continued)

Terminal	Value	Description
EXECUTE		When changing from 0 to 1 the RCOM channel requests the modem to go on hook. The completion of the hang-up execution is indicated by the terminal EXECDONE.
EXECDONE	0	1 after completion of the hang-up execution. The terminal ERR indicates whether the hang-up failed or not. EXECDONE is reset by setting the Terminal EXECUTE to 0.
VALID		1 after successful command execution.
ERR		1 in case of error in command transmission. In this case the terminal is reset after the next successful transmission of the RCOM command.
REF1-REF8(24)		Not used.

Alarm Dial-up

On a slave dial-up is performed by system (without configuring a MVB) in following cases:

- system error occurred which caused a system message
- time-tagged event has been generated by a DB element DIC, AIC, DIMVB, AIMVB and alarm dial-up is enabled for this event source (terminal AL_DIAL).

Executing the alarm dial-up the MVI takes the dial strings and the phone numbers from the terminals DIALSTR1-DIALSTR4 and PHONENO1-PHONENO4 at the DB element MVINODE. If the dial-up fails for a phone number after a certain number of retries the next phone number is dialed. A maximum of 4 phone numbers are provided. The number of retries for every phone number is specified by the terminal PARAM7 at the DB element MVICHAN.

It is recommended to execute the hang-up command on the master. A criteria for hang-up is the bit 15 ('poll data reception time-out') in RTU status 1. This bit is set on the master when no data have been received by polling within a specified time and is reset after receiving the next MVB or time-tagged event by polling. Thus this status bit can be used to determine when the slave has sent all events and system messages up to the master. The time-out can be configured by the terminal PARAM8 at the DB element MVICHAN. The recommended value is 100 seconds. Note that polling has lower priority than MVB transmission. So this time-out will be useful only if polling is not fully suppressed by MVB transmission.

3.8.8 PC Program Layout

To control the data flow on the asynchronous communication link a PC program is necessary in the AC110.

Normally a PC program is used only for a MVI channel in master mode. The PC program evaluates the status information about the slave nodes and the RCOM link from the DB elements MVICHAN and MVINODE and controls the slaves by DB elements MVB (see figure below).

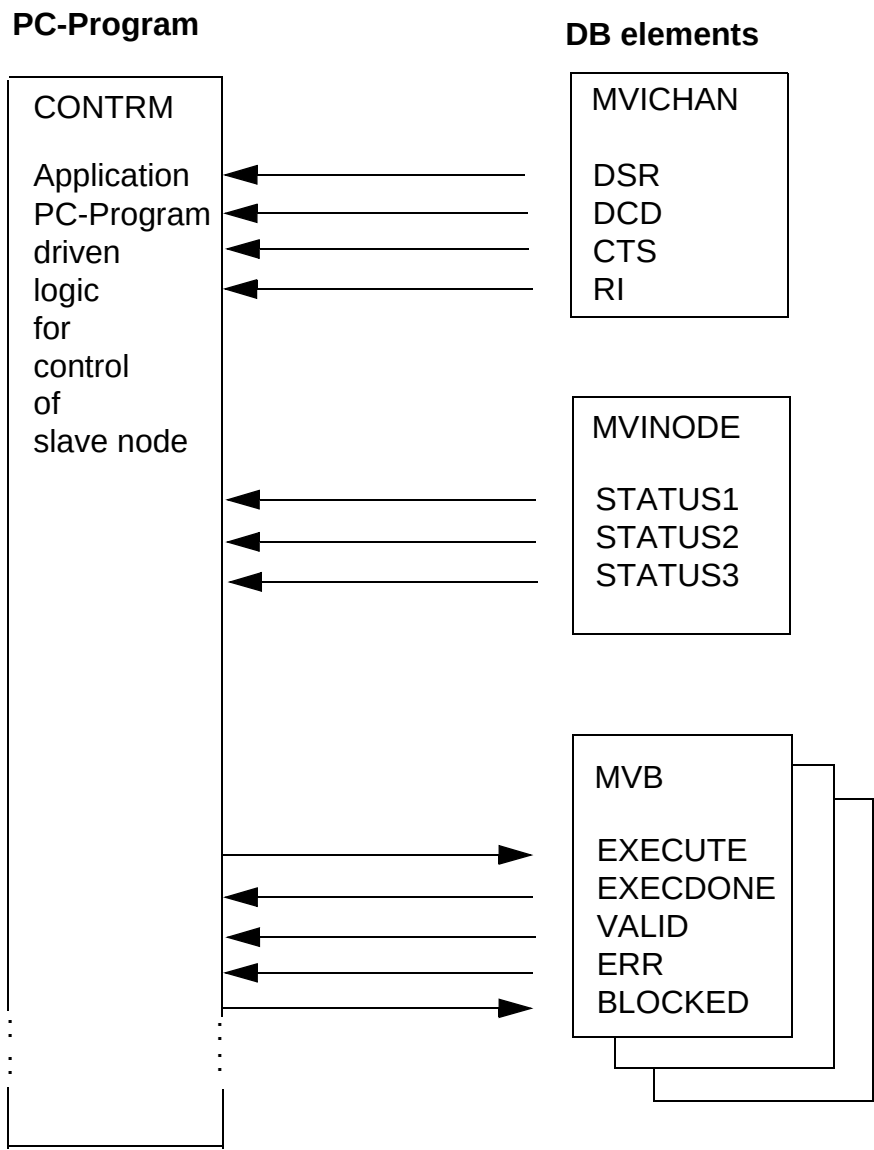


Figure 3-25. PC program layout for control of an RCOM node

It is recommended to include the PC program part for every slave node in an own CONTRM
The cycle time of the CONTRM should be approximately 100ms.

In slave mode a PC program is only necessary for RCOM if data should be transmitted to the master in an event driven way (e.g. to inform the master about I/O signal changes on the slave).

3.8.8.1 RCOM Data Flow Control Type Circuits

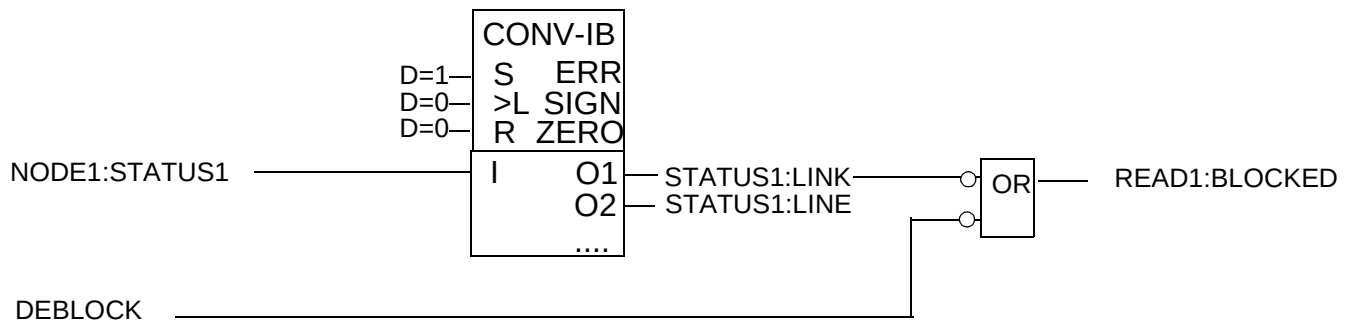


Figure 3-26. Function block for control of cyclic data transfer

The design on the PC function block designed for the execution depends on whether the MVB is executed cyclically or not.

For cyclic data transfer the Data MVB's are just deblocked setting the terminal BLOCKED to 0.

It is recommended to connect the deblock signal with the link status (see figure above).

For dial-up lines the line status should be included in this action.

In this section 3 type circuits are proposed to easy the handling of MVB's in the case of single execution.

Type circuit EXECMVB1 (see Figure 3-27) has the aim to automate the reset of a MVB after its execution.

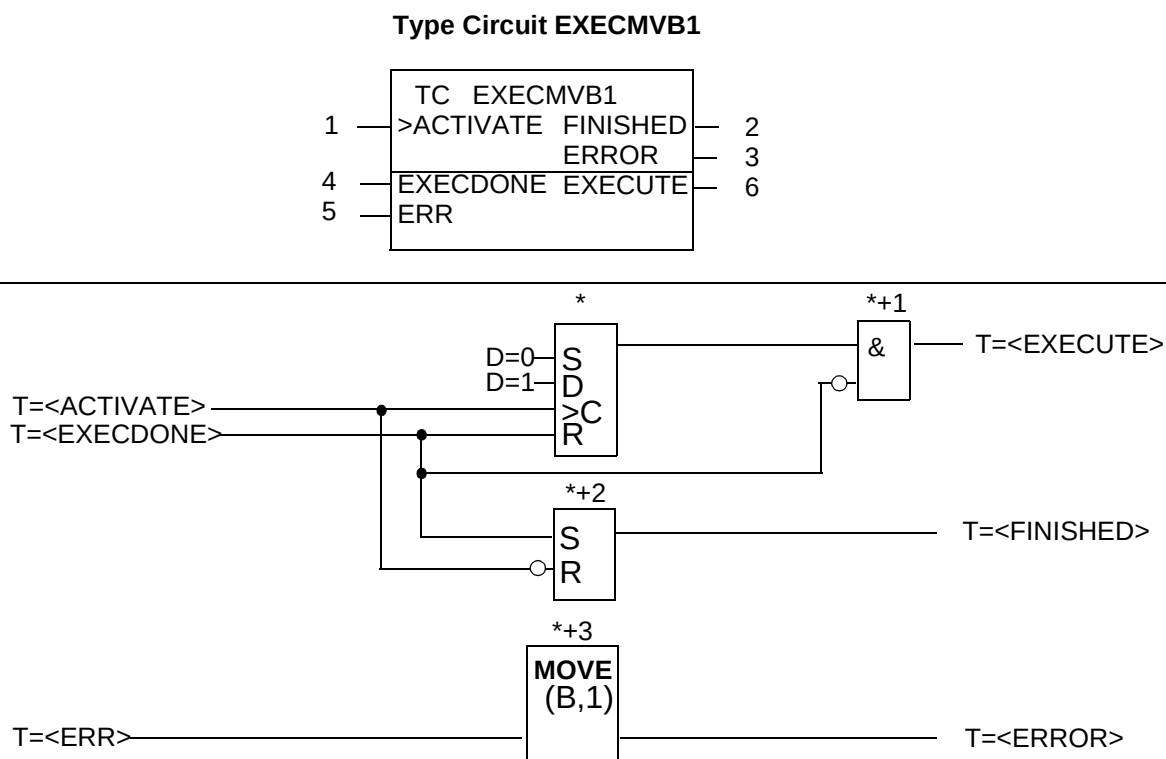


Figure 3-27. Type circuit EXECMVB1

The terminals EXECDONE, ERR and EXECUTE of the type circuit must be connected to the identical terminals of the MVB.

Setting the input terminal **ACTIVATE** of the type circuit **EXECMVB1** the execution of the connected **MVB** is requested. The output terminal **FINISHED** becomes 1 after completion of the **MVB** execution. Reading the terminal **ERROR** as long as **READY** is set it can be defined whether the command execution has succeeded or not. The next **MVB** execution can be requested by the terminal **ACTIVATE** as soon as the terminal **FINISHED** is 1.

To understand the function of the type circuit it has to be remembered that the execution of a MVB is requested by terminal EXECUTE. The terminal EXECDONE becomes 1 after completion of the MVB execution. At the same time the terminal ERR indicates whether the MVB execution failed or not. In this type circuit the terminal EXECUTE is forced through the PC element $*+1$ to 0 as long as the terminal EXECDONE is 1. As a result the terminal EXECDONE is reset by the MVI. So the type circuit returns into the initial state.

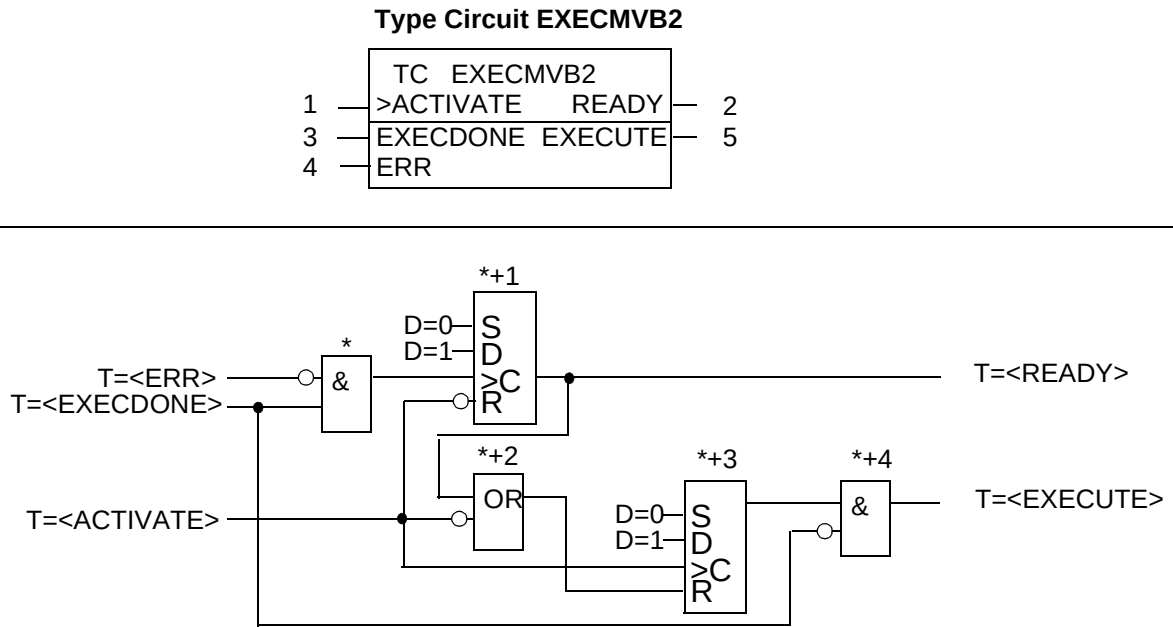


Figure 3-28. Type circuit EXECMVB2

The type circuit EXECMVB2 in the figure above includes an additional functionality - an automatic retry mechanism in case of the execution of the MVB failed. The MVB is executed until it succeeds or the terminal ACTIVATE is reset. The successful MVB execution is indicated by terminal READY.

The automatic retry of command execution in case of failure is realized by the feedback between the terminals EXECUTE and EXECDONE. This feedback is active until the combination EXECDONE=1 and ERR=0 (successful execution) occurs.

Type Circuit EXECMVB3

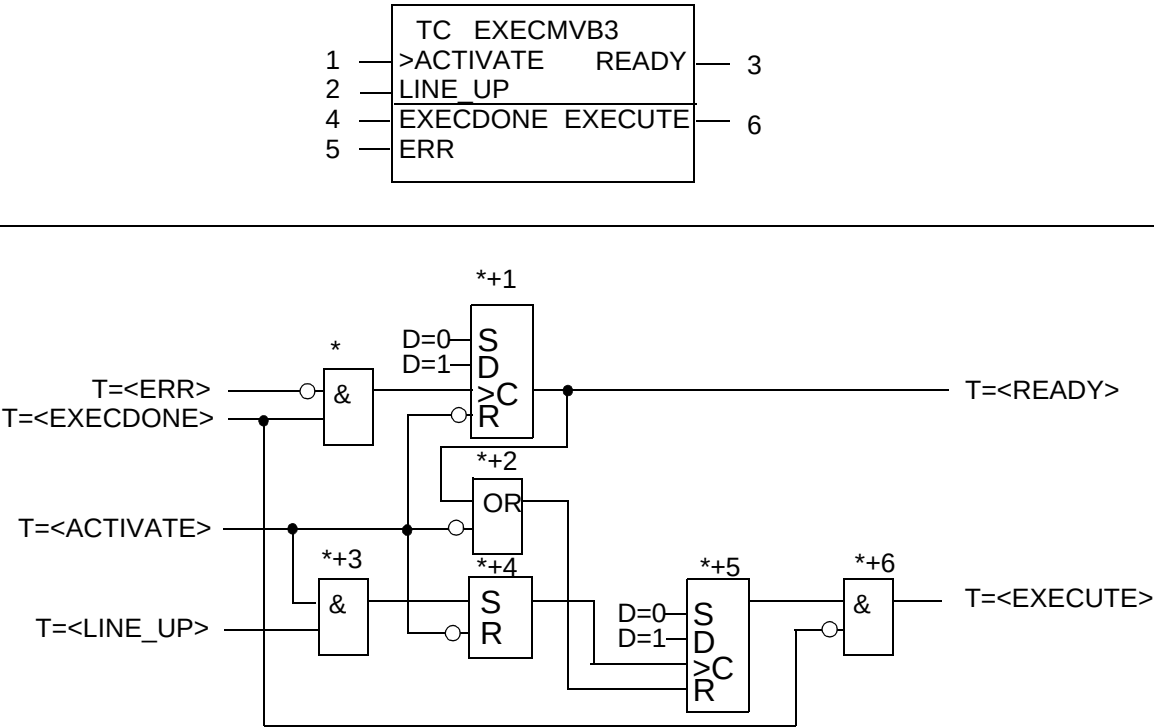


Figure 3-29. Type circuit EXECMVB3

The type circuit in the figure above includes the automatic retry mechanism as in type circuit EXECMVB2. In addition, the line status is taken into account, i.e. the execution of the MVB is only started if the line is up.

To execute several MVB's in a sequence these type circuits can be connected in a sequence. See next section (RCOM data flow control)

3.8.8.2 RCOM Data Flow Control

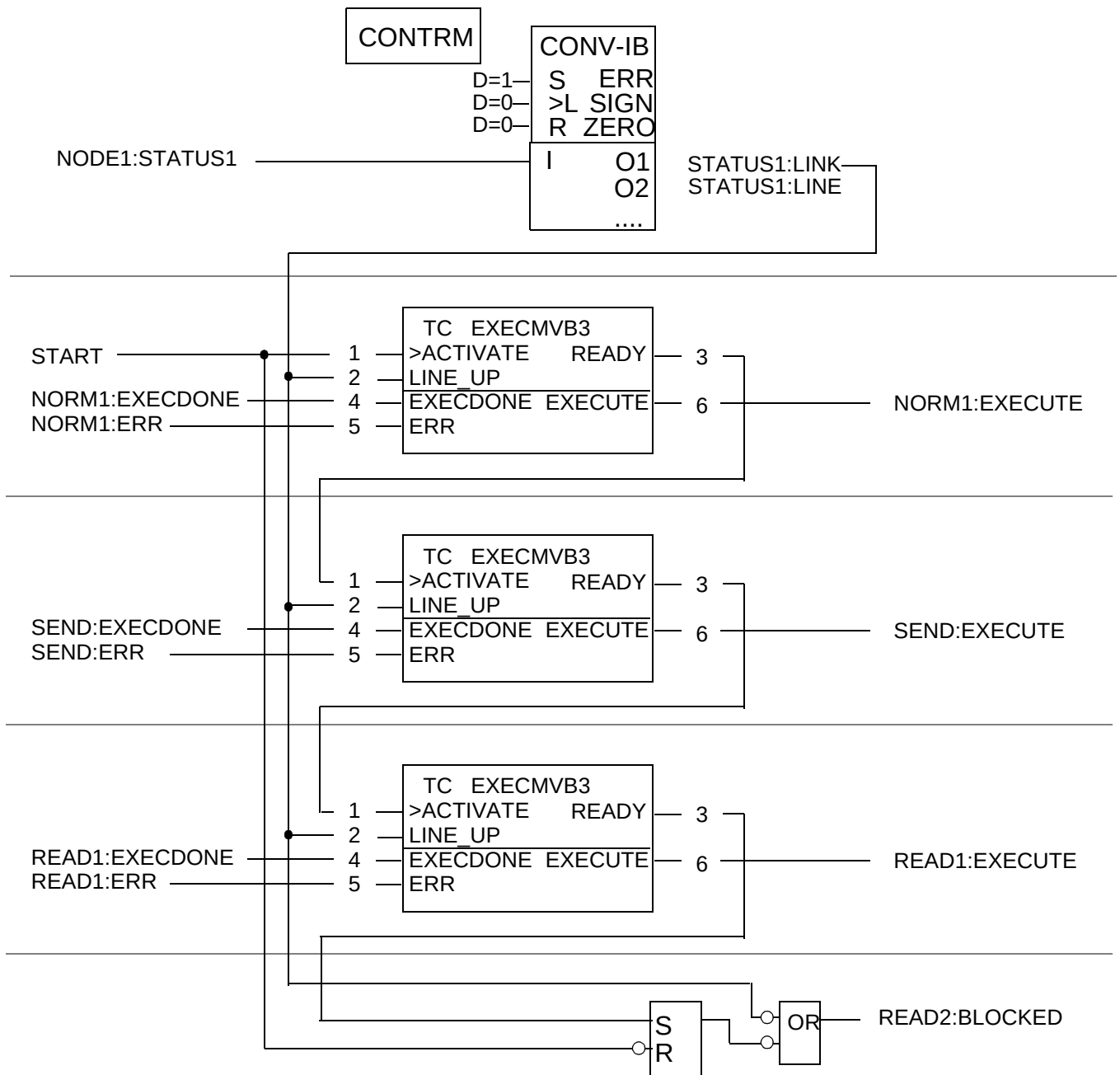


Figure 3-30. MVB sequence for read/write data transfer initiated by PC program on the master side.

3.8.8.3 Transmission of Time-Tagged Events from Event Sets

Time-tagged events can be transmitted from an Event Sets element on a RCOM slave node to another Event Set element on a master node. (For more information about Event Sets see the manual *AMPL Configuration for Advant Controller 100 series*.)

Before events can be received on the master from a certain slave the normalization command has to be sent to this slave.

Besides, it has to be taken into account that time-tagged events are transmitted by polling which is performed by the master node module when no MVI Data Blocks are transmitted. Thus, the transmission of MVBs has a higher priority than the transmission of time-tagged events. Therefore the application has to be built in a way that the MVB transmission does not fully suppress polling and, hence, the transmission of time-tagged events.

This requirement can be fulfilled by taking following two measures:

1. Keep the load on the RCOM link (including the load from the time-tagged events) less than 100% (for load calculation see section 3.2.2 Total Load on RCOM Link).
2. Build an application which controls the execution of MVBs in a way that the transmission of time-tagged events is covered.

The second point can be realized by two variants of application building.

Variant 1

The basic idea is to set a certain poll cycle time in the master MVI channel (terminal POLLCYCL at DB element MVICHAN) and to control the deblocking of all cyclically executed MVBs by the MVI status bit "poll time-out" from all slave nodes (terminal STATUS1 at DB elements MVINODE). This approach guarantees that within a certain period every slave is polled at least once and, hence, time-tagged events are received from the slave.

In the figure below an application example for the realization of this approach is shown. The status bit "poll time-out" from **all** slave nodes is connected to a PC element OR. The output of this PC element controls the deblocking of **all** cyclically executed MVBs (read or write commands).

As long as the master MVI channel manages to poll all slave nodes within the poll cycle time all status bits "poll time-out" are 0 and the MVB elements are deblocked. As soon as the master MVI channel has not managed to poll at least one slave within the poll cycle time due to a heavy MVB traffic on the link the corresponding status bits "poll time-out" goes up. In the result all MVB elements are blocked as long as the slave with poll time-out has been polled. So you get a simple "regulator" which provides the transmission of time-tagged events and MVBs simultaneously.

The MVI channel parameter configuring the maximum number of polls per cycle and slave (terminal PARAM4 at DB element MVICHAN) must be set to 1.

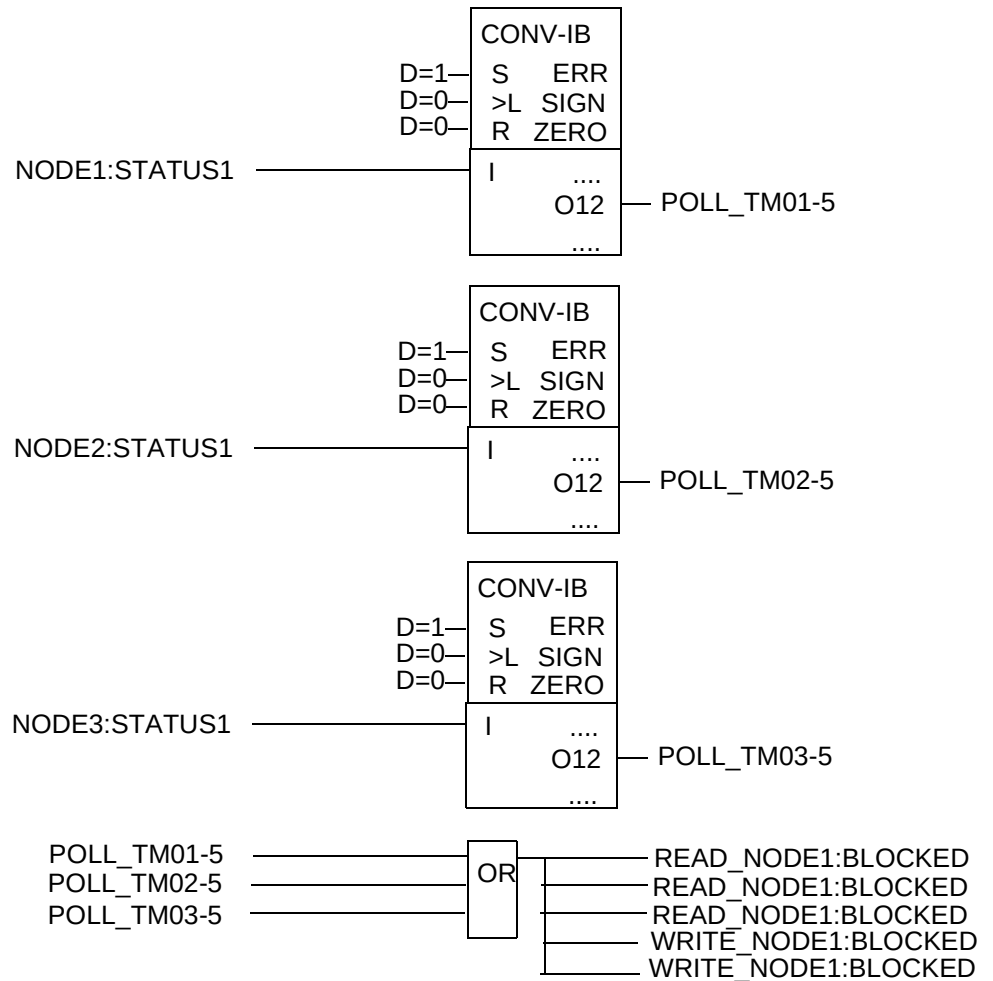


Figure 3-31. Control of MVBs by poll time-out

The poll cycle time T_{poll_cycle} on the master MVI channel **and on all slave MVI channels** within the same RCOM network must be configured with the value calculated by following formula:

$$T_{poll_cycle} = N \cdot \left(\frac{1200}{S} + 0,2 \right) + 3$$

where

N = number of slave nodes

S = communication speed (bit/s)

T_{poll_cycle} must not exceed 20 seconds.

In Table 3-31 the MVI poll cycle time (terminal PARAM4) for some RCOM network configurations is shown.

Table 3-31. MVI poll cycle time for some network configurations (examples)

Communi- cation speed S (bit/s)	Number of slaves	MVI poll cycle time T_{poll_cycle} (s)
1200	8	10
2400	16	12
9600	8	3
9600	16	6

It is recommended not to send MVBs in an event-driven manner from a slave which is prepared to send time-tagged events to the master.

This variant of application building can not be applied for dial line connections because in this case the status flag “poll time-out“ is not handled.

Variant 2

The basic idea in this variant is to block the cyclic MVB transmission as soon as an time-tagged event on a slave is generated. The generation of an event on a slave node can be realized on the master by reading the terminals Q_EMPTY of all EVS elements via a MVB. Note that the transmission of the MVB transmitting the value of the Q_EMPTY terminals must never been blocked because otherwise the actual queue state is not available in the MVB on the master! It is recommended to specify a cycle time of more than 5 seconds for this MVB because the reading of the Q_EMPTY terminals should not brake the event transmission.

In the case of dial line it is proposed to block the MVB transmission before the hang-up is made and then to allow the transmission of time-tagged events until all EVS event queues become empty.

The poll cycle time (PARAM4) on the master MVI channel **and on all slave MVI channels** within the same RCOM network must be configured with the value calculated by the formula described above.

3.8.9 Configuration with MasterPiece 40

This example describes the necessary application programming for one slave node MasterPiece 40.

The configuration is a dial-up telephone line (one slave).

Configuration on the master node: (AC 110)

- Station number = 1
- CI532 position number = 2
- Network number = 1
- Own node number = 4
- Own telephone number = 1625 (no switchboard).

Configuration on the Modem:

- Transmission speed 1200 bits/s, full duplex, V.22
- Direct asynchronous mode
- Hayes without id
- No pause for dial tone after command
- DCD active
- DTR for modem reset.

Configurations on the slave node (MP 40):

- Own node number = 21
- Own telephone number = 1651 (no switchboard)
- Transmission speed 1200 bits/s, full duplex, V.22.

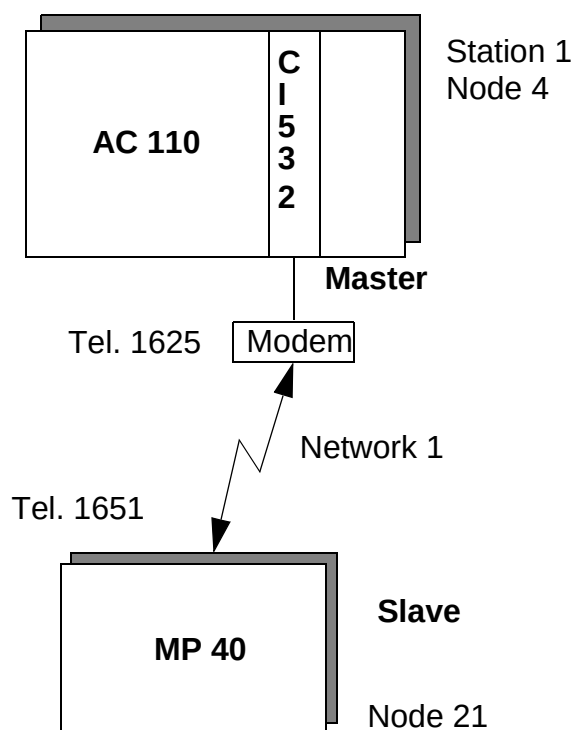


Figure 3-32. Configuration

3.8.9.1 Application in Master Node AC110

DB Elements

Four **Configuration DB elements** must be build. Device configuration CI610, CI532, the channel characteristics MVICHAN, Node configuration and node Status MVINODE

Four Command MVB's are used. Cold Start, Normalize, Dial-up the slave and Hang-up.

Two Command MVB are optional: Warm Start, Clock Synch.

Several **Data MVB** are used for the actual data transfer. MVB's for Sending Data to the slave and MVB's for Receiving Data (Events) from the slave.

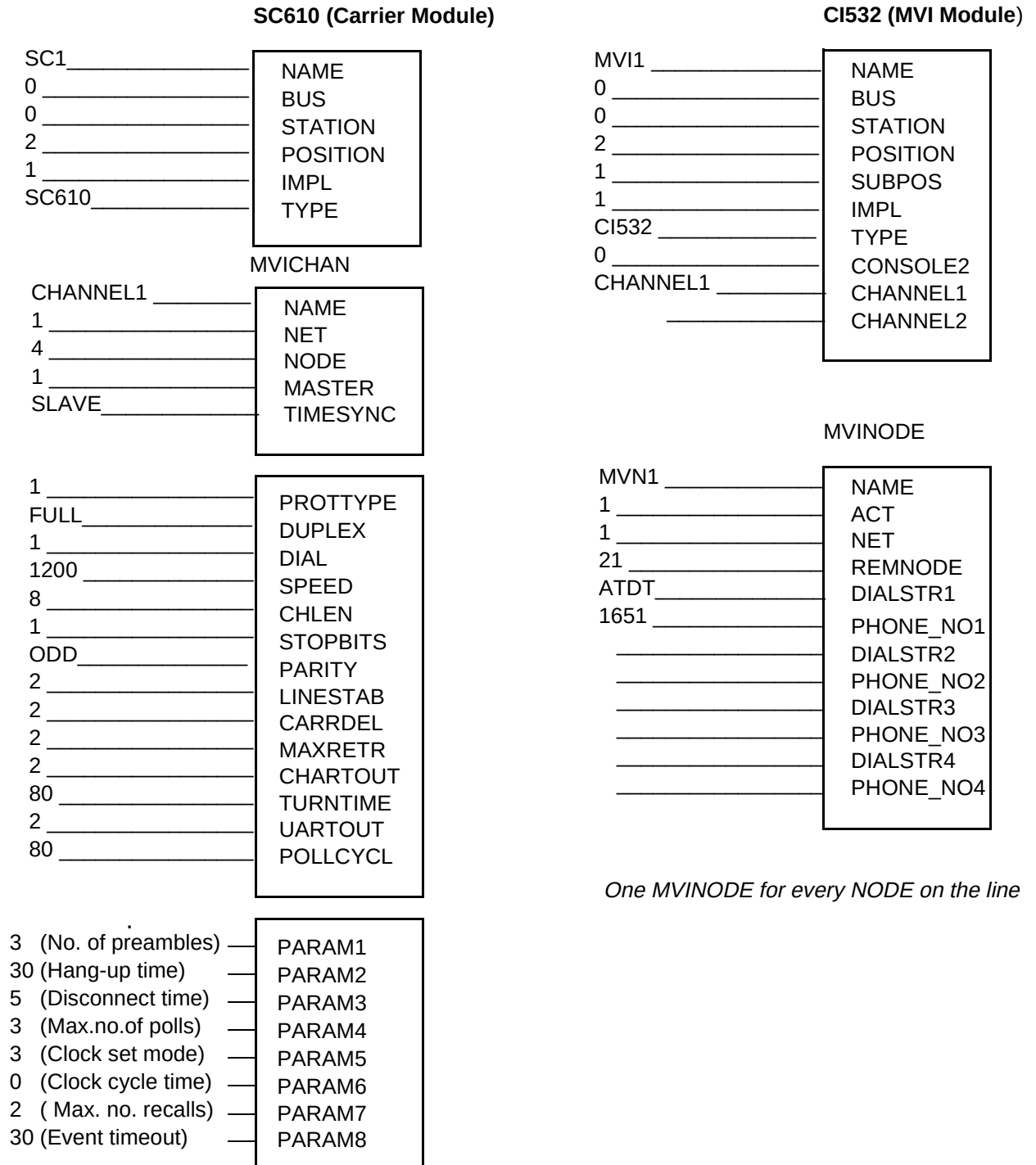


Figure 3-33. Configuration and RCOM status DB elements

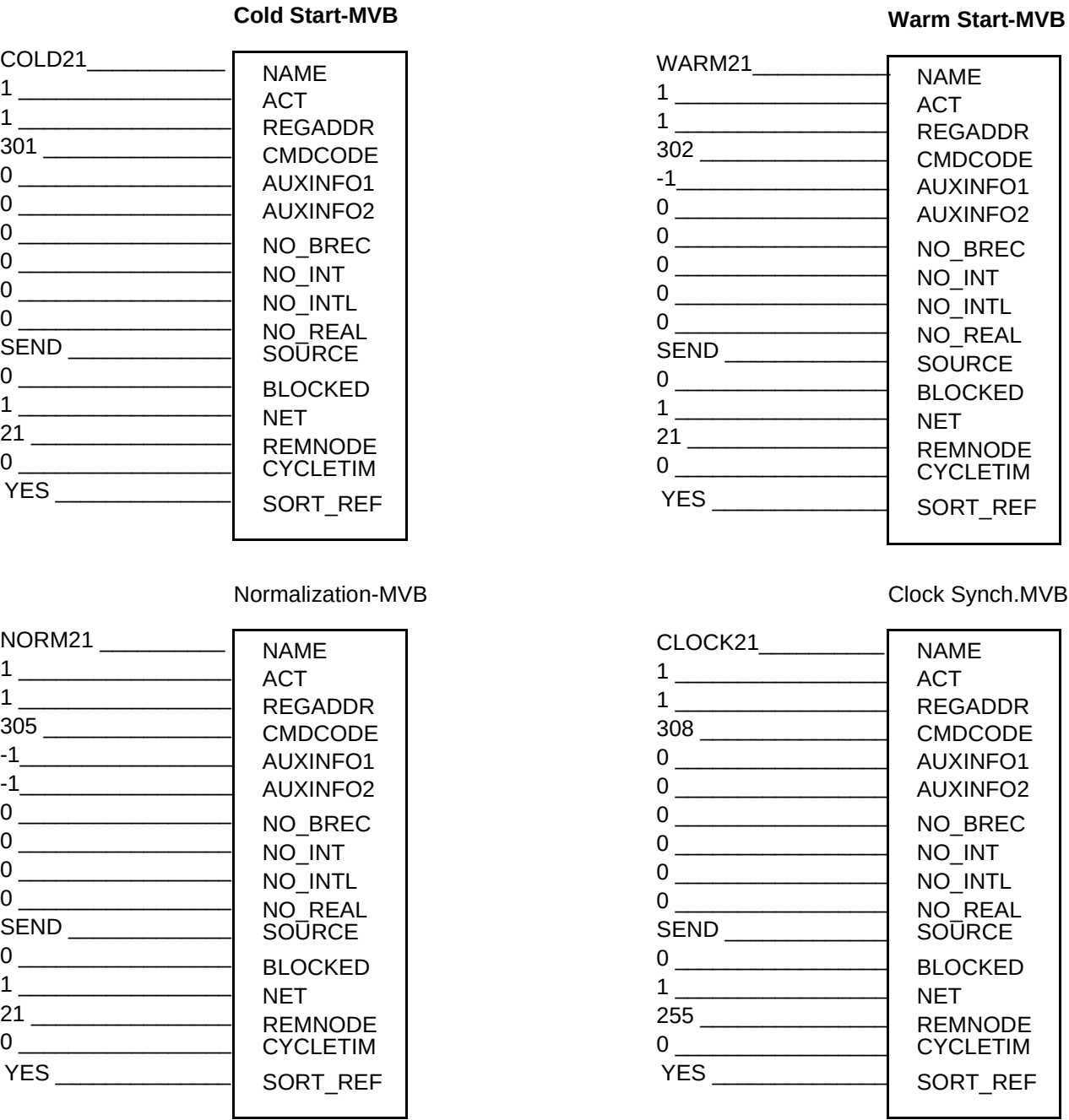


Figure 3-34. Command MVB DB elements

DIAL-UP MVB		HANG-UP MVB	
DIAL21_____	NAME	HANGUP21_____	NAME
1 _____	ACT	1 _____	ACT
1 _____	REGADDR	1 _____	REGADDR
3 _____	CMDCODE	4 _____	CMDCODE
0 _____	AUXINFO1	0 _____	AUXINFO1
0 _____	AUXINFO2	0 _____	AUXINFO2
0 _____	NO_BREC	0 _____	NO_BREC
0 _____	NO_INT	0 _____	NO_INT
0 _____	NO_INTL	0 _____	NO_INTL
0 _____	NO_REAL	0 _____	NO_REAL
SEND _____	SOURCE	SEND _____	SOURCE
1 _____	BLOCKED	1 _____	BLOCKED
1 _____	NET	1 _____	NET
21 _____	REMNODE	21 _____	REMNODE
0 _____	CYCLETIM	0 _____	CYCLETIM
YES _____	SORT_REF	YES _____	SORT_REF

STATUS-MVB		STATUS- MVB	
MP40UNISTAT_____	NAME	MP40SYSTAT_____	NAME
1 _____	ACT	1 _____	ACT
232 _____	REGADDR	237 _____	REGADDR
110 _____	CMDCODE	110 _____	CMDCODE
0 _____	AUXINFO1	0 _____	AUXINFO1
0 _____	AUXINFO2	0 _____	AUXINFO2
6 _____	NO_BREC	2 _____	NO_BREC
0 _____	NO_INT	0 _____	NO_INT
0 _____	NO_INTL	3 _____	NO_INTL
0 _____	NO_REAL	0 _____	NO_REAL
RECEIVE _____	SOURCE	RECEIVE _____	SOURCE
1 _____	BLOCKED	1 _____	BLOCKED
1 _____	NET	1 _____	NET
21 _____	REMNODE	21 _____	REMNODE
0 _____	CYCLETIM	0 _____	CYCLETIM
YES _____	SORT_REF	YES _____	SORT_REF

Figure 3-35. Telephone command MVB DB elements and optional MP 40 status MVB's.

NOTE

2 further optional Data MVB's are recommended for diagnosis,
with REGADDR (= 'Ident') =232 or 237. See MP 40 User's Manual

DI-MVB

DI21U1 _____
1 _____
1 _____
110 _____
0 _____
0 _____
1 _____
0 _____
1 _____
0 _____
RECEIVE _____
0 _____
1 _____
21 _____
0 _____
YES _____

NAME
ACT
REGADDR
CMDCODE
AUXINFO1
AUXINFO2
NO_BREC
NO_INT
NO_INTL
NO_REAL
SOURCE
BLOCKED
NET
REMNODE
CYCLETIM
SORT_REF

DO-MVB

DO21U1 _____
1 _____
3 _____
210 _____
0 _____
0 _____
1 _____
0 _____
0 _____
0 _____
SEND _____
0 _____
1 _____
21 _____
16 _____
YES _____

NAME
ACT
REGADDR
CMDCODE
AUXINFO1
AUXINFO2
NO_BREC
NO_INT
NO_INTL
NO_REAL
SOURCE
BLOCKED
NET
REMNODE
CYCLETIM
SORT_REF

Value references 1-16

DIB21U1 _____
TDI21U1 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____

REF1
REF2
REF3
REF4
REF5
REF6
REF7
REF8
REF9
REF10
REF11
REF12
REF13
REF14
REF15
REF16

Value references 1-16

DOB21U1 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____
0 _____

REF1
REF2
REF3
REF4
REF5
REF6
REF7
REF8
REF9
REF10
REF11
REF12
REF13
REF14
REF15
REF16

Figure 3-36. Data MVB DB elements for Digital Inputs and Digital Outputs

3-86

3BSE 003 181R0001 Rev A

AI-MVB		AI-MVB	
AI1_21U1 _____	NAME	AI2_21U1 _____	NAME
1 _____	ACT	1 _____	ACT
4 _____	REGADDR	5 _____	REGADDR
110 _____	CMDCODE	110 _____	CMDCODE
0 _____	AUXINFO1	0 _____	AUXINFO1
0 _____	AUXINFO2	0 _____	AUXINFO2
1 _____	NO_BREC	1 _____	NO_BREC
0 _____	NO_INT	0 _____	NO_INT
1 _____	NO_INTL	1 _____	NO_INTL
4 _____	NO_REAL	4 _____	NO_REAL
RECEIVE _____	SOURCE	RECEIVE _____	SOURCE
0 _____	BLOCKED	0 _____	BLOCKED
1 _____	NET	1 _____	NET
21 _____	REMNODE	21 _____	REMNODE
0 _____	CYCLETIM	0 _____	CYCLETIM
NO _____	SORT_REF	NO _____	SORT_REF

Value references 1-16		Value references 1-16	
AI21ST1U1 _____	REF1	AI21ST2U1 _____	REF1
AI21V1U1 _____	REF2	AI21V5U1 _____	REF2
AI21V2U1 _____	REF3	AI21V6U1 _____	REF3
AI21V3U1 _____	REF4	AI21V7U1 _____	REF4
AI21V4U1 _____	REF5	AI21V8U1 _____	REF5
T1AI21U1 _____	REF6	T2AI21U1 _____	REF6
0 _____	REF7	0 _____	REF7
0 _____	REF8	0 _____	REF8
0 _____	REF9	0 _____	REF9
0 _____	REF10	0 _____	REF10
0 _____	REF11	0 _____	REF11
0 _____	REF12	0 _____	REF12
0 _____	REF13	0 _____	REF13
0 _____	REF14	0 _____	REF14
0 _____	REF15	0 _____	REF15
0 _____	REF16	0 _____	REF16

Figure 3-37. Data MVB DB elements for Analog Inputs

CN-MVB(DI-Counter)		AO-MVB	
CN21U1 _____	NAME	AO21U1 _____	NAME
1 _____	ACT	1 _____	ACT
2 _____	REGADDR	6 _____	REGADDR
301 _____	CMDCODE	302 _____	CMDCODE
0 _____	AUXINFO1	0 _____	AUXINFO1
0 _____	AUXINFO2	0 _____	AUXINFO2
1 _____	NO_BREC	0 _____	NO_BREC
0 _____	NO_INT	0 _____	NO_INT
7 _____	NO_INTL	1 _____	NO_INTL
0 _____	NO_REAL	2 _____	NO_REAL
RECEIVE _____	SOURCE	SEND _____	SOURCE
0 _____	BLOCKED	0 _____	BLOCKED
1 _____	NET	1 _____	NET
21 _____	REMNODE	21 _____	REMNODE
0 _____	CYCLETIM	16 _____	CYCLETIM
YES _____	SORT_REF	YES _____	SORT_REF

Value references 1-16		Value references 1-16	
CNST21U1 _____	REF1	AO21STU1 _____	REF1
CN1_21U1 _____	REF2	AO21V1U1 _____	REF2
CN2_21U1 _____	REF3	AO21V2U1 _____	REF3
CN3_21U1 _____	REF4	0 _____	REF4
CN4_21U1 _____	REF5	0 _____	REF5
CN5_21U1 _____	REF6	0 _____	REF6
CN6_21U1 _____	REF7	0 _____	REF7
TCN21U1 _____	REF8	0 _____	REF8
0 _____	REF9	0 _____	REF9
0 _____	REF10	0 _____	REF10
0 _____	REF11	0 _____	REF11
0 _____	REF12	0 _____	REF12
0 _____	REF13	0 _____	REF13
0 _____	REF14	0 _____	REF14
0 _____	REF15	0 _____	REF15
0 _____	REF16	0 _____	REF16

Figure 3-38. Data MVB DB elements for Counter Inputs and Analog Outputs optional

- Note 1:** Further optional Data MVB's are needed for the MP 40's expansion units. See *MP 40 User's Guide*.
- Note 2:** Further optional Data MVB's are needed for the MP 40's parameters if they shall be read or written.
REGADDR (= 'Ident') in the range of 33 to 238. The answer of Read MVB's (33 to 238) is on 'Ident' = 239/240.

PC Program in the Master (AC 110)

The **PC program** is the master node is designed as described in the chapter PC Program Layout. The use of type circuits is recommended. See chapter PC program layout.

The necessary function for MP 40 are:

Cold start

Normalization

Clock synchronization

Deblock of MVB for data polling

Control of EXECUTE of MVB's.

3.8.9.2 Parameters on the Slave Node (MP 40)

Parameters on the slave node (MP 40):

- Node number = 21
- Own telephone number = 1651 (no switchboard)
- Line type= Dial-up
- Duplex = Full
- Transmission speed = 1200 bit/s
- Number of bits = 8
- Stopbits = 1
- Parity = odd
- No. of preambles = 3
- Linestab = 2
- Carrdel = 2
- Chartout = 2
- Hang up time = 30
- Disconnect time = 10
- Polltimeout = 15.

No Application program is needed and no DB-elements for configuration.

For Parametrization see MP 40 User's manual.

Chapter 4 Runtime Operation

4.1 Product Operation

The AC 110 must be started (mode P1) to be able to communicate on the RCOM link.

For starting the AC 110 please see the documents AC 110 Technical Description, AMPL Configuration for Advant Controller 100 series and the *AS 120 ES User's Guide*.

4.2 Operating Overview

After start-up of the AC 110 the following operations concerning RCOM can be controlled:

- From the PC program for activation of Command and Flow control
 - Activate/stop sending of Data MVB's (Read/Write).
 - Activate/stop sending of Command MVB's (Cold start, Warm start, Normalize, Clock synchronization and Telephone commands)
- The configuration of the module CI532 or the RCOM SW driver can be changed on line.
- The status information for the RCOM link in the RTU Status words can be displayed.

4.3 Runtime Tutorial

A Runtime Tutorial is not included in this manual. The reader must be familiar with application commands in the engineering station AS 120 ES. Please refer to the AS 120 ES user's manual.

4.4 Operating Instructions

For description of commands for control of PC program and data base please refer to the document AC 110 Configuration and Programming.

4.5 Runtime Operating Menus

Runtime operating menus are provided in the AS 120 ES engineering station. The reader must be familiar with application commands in the engineering station AS 120 ES. Please refer to the *Advant Station 120 Engineering Station User's Guide*.

Chapter 5 Maintenance

5.1 Hardware Indicators

This chapter is valid for RCOM using MVI.

The 'Run' LED indicates that the SW on the modules is configured, started and running.

5.2 Software Indicators

This chapter is valid for RCOM using MVI or using SW Driver

Software Indicators

The status of the control signals of each of the four channels is available as an output of the related DB element MVICHAN: The status may be observed with an AS 120 ES, e.g. if the outputs are connected to any PC element (e.g. for connection to a Digital Output).

DSR	Data Set Ready
DCD	Data Carrier Detect
CTS	Clear To Send
RI	Ring Indicator.

RCOM Status

The RCOM Status is provided at AC110 stations with at least one MVI channel in slave mode.

System errors related to the RCOM option are converted in RCOM system messages. Receiving a system message a MVI in master mode sets the corresponding bit in RCOM status word 2.

The Status Word 2 is available at the terminal STATUS2 of the DB element MVINODE in the master station (AC 110).

(In case of a MP 200/1 master station Status Word 2 is available at the terminals REF9-REF16 of an MS with Ident 03 or 13, see *RCOM Advant Controller 400 series User's Guide*)

(In case of a MasterPiece 40 slave station the status bits are documented in the *Master Piece 40 User's Guide*.)

Below the meaning of the bits of the Status Word 2 for AC110 are explained.

Status Word 2 for AC110 and corresponding Error Codes for CPU Diagnostic Display.

Table 5-1. Status Word 2 and Error Codes

Status bit	Description	Significance	Error codes
Value bit 0	Slave restarted	The slave has carried out a system cold start.	49,59
Value bit 1	Not used by AC110		
Value bit 2	Checksum error, application	The CRC checksum of the RAM containing the configuration data and the application program was wrong.	47
Value bit 3	Not used by the AC110		
Value bit 4	Not used by the AC110		
Value bit 5	Not used by the AC110		
Value bit 6	Not used by the AC110		
Value bit 7	Event queue full⁽¹⁾	At least one event queue is filled by 80%.	58
Value bit 8	Not used by the AC110		
Value bit 9	Power failure	A power failure has occurred.	4A
Value bit 10	I/O module error	An I/O module error was detected.	53
Value bit 11	Processor exception	The processor executed an exception (zero divide, address error etc.).	05,2F, 4C,4D,4E
Value bit 12	System overload	A 3. or 4. activation of a task was executed by the system software. This is caused by system overload.	41,42
Value bit 13	Battery not OK	No battery is plugged or the battery is down.	4F,4B,52
Value bit 14	Not used by the AC110		
Value bit 15	Not used by the AC110		
Value bit 16	Watchdog alarm	The watchdog was not handled by the system software, i.e. the system software is stalled.	09,54
Value bit 17-31	Not used by the AC110		

(1) '**Event queue full**' means that at least the event queue of one Event Set (DB element EVS(S), EVS (T)) is filled by 80%. For description of Event Sets see document AMPL Configuration AC 100 Series.

The above mentioned errors cause RCOM system messages from slave to master and the corresponding bits in status word 2 of the master are set.

5.3 Module Diagnosis

If RCOM communication does not work, first check the status LEDs on the MVI front. If the red FAULT LED is on or the green RUN LED is off, restart the system by pressing INIT with the start mode selector in CLEAR or AUTO position, after saving your application program to PROM.

In case of 'activate module failed' or 'activate channel failed' restart the system as described before. Check application.

In case of 'I/O-Module has wrong type', check whether the configured DB element matches to the plugged in module on the displayed position.

If the application program is running but the RCOM connection does not work, check the cable and connection of the modem as well as the application program, see next chapter.

The tool, e.g. AS 100 Series ES, delivers detailed error information in FCB's ERROR REPORT and MODULE DIAGNOSIS. When checking the module diagnosis for either the MVI or the processor module, click on the objects 'Device', 'MVI channel', 'MVI node' and 'MVI data block' in order to see detailed error information about the RCOM line.

For further information please refer to the *Advant Controller 110 User's Guide* Chapter Fault Tracing and the *Function Chart Builder* documentation.

5.4 Fault Finding and User Repair

If you have followed the instruction in the preceding chapters, and still does not have a correct working communication link after commissioning, please check the following, using the AS 120 ES engineering station:

1. Are the SC610 and CI532V01 correctly filled in?

Check the parameters: STATION, POSITION, SUBPOSITION, REF to the right MVICHAN describing the connected channel and the parameters (own) NET, NODE of the MVICHAN.

The CI532V01 is restarted after download of a new application with new parameters, see above.

2. Are modems and cables correctly set-up?

The correct modem signals must be received by the CI532V01 or by CH2 of the processor module, respectively. When full duplex mode for the modem signals is selected the signal Data Set Ready DSR, Data carrier detect DCD and Clear to Send CTS must be set (also in telephony mode). In half duplex mode the DSR must be set and DCD and CTS must toggle between 0 and 1. See chapter 3 DB element MVICHAN.

Current values of DSR, DCD and CTS are available at the DB element MVICHAN. Note that displayed values from the MVICHAN element on the AS 100 ES are not synchronized to the actual value change of the signals, short pulses may not be displayed.

The modem signals are set-up by the modem or in full duplex mode they can be wired in the 25 position connector on the modem cable (See Chapter 2).

3. Check the data base and PC application:
 - Check that the remote node numbers (REMNODE) of the DB elements MVINODE and MVB's correspond to the (own) node numbers of all the slaves at the line. Check the NET numbers also.
 - In Master mode the Command MVB for Normalize/deblock must be built and sent to the corresponding slave to get polled data/events from the slave.
 - Data MVB for the actual data transfer must be defined. A SEND MVB in a slave must have a corresponding RECEIVE MVB with the same NET and REGADDR (IDENT) in the master and vice versa.
 - The PC program for the flow control must be built and started (Not always necessary in slave mode, see Chapter 3).

4. Are there any errors reported in the Error Report of the AC 110?

Error Reports are checked by connecting an Advant Station 100 ES to the AC 110. see preceding section. Note that some errors are only reported once. Include a listing in your answer.

5. What Status Bits are set in the RTU Status Word?

Status bit 0 is set when the AC 110 has established connection to the RTU, see Chapter 3, DB element MVINODE.

If you also know the answer to the following questions it will be easier to make further analysis:

- a. Is the installation of modems and cables made according to the description in the manual ABB Master System Installation Rules. Note specially power supply and connection to signal ground.
- b. How is your control system configured? A block diagram with all node- and network numbers is useful. Note also type of RTU, the master and the slaves on the link and type of modem you are using.
- c. Were there any significant changes (e.g. new communication board(s) added, new modems) made in your configuration?
- d. Is it possible to repeat your problem?
- e. Have you found any way to circumvent the problem?
- f. Are there any other observations, related to the problem, made?

A test tool for monitoring the status of the V.24 leads is useful for further analyze. The test tool shows the status, with LED indicators, of the modem signals, data transmission (TD) and reception (RD). In cases where an analyze of the data flow on the RCOM link is necessary, you need a Data Link Analyzer that monitors and stores the signals sent on the link.

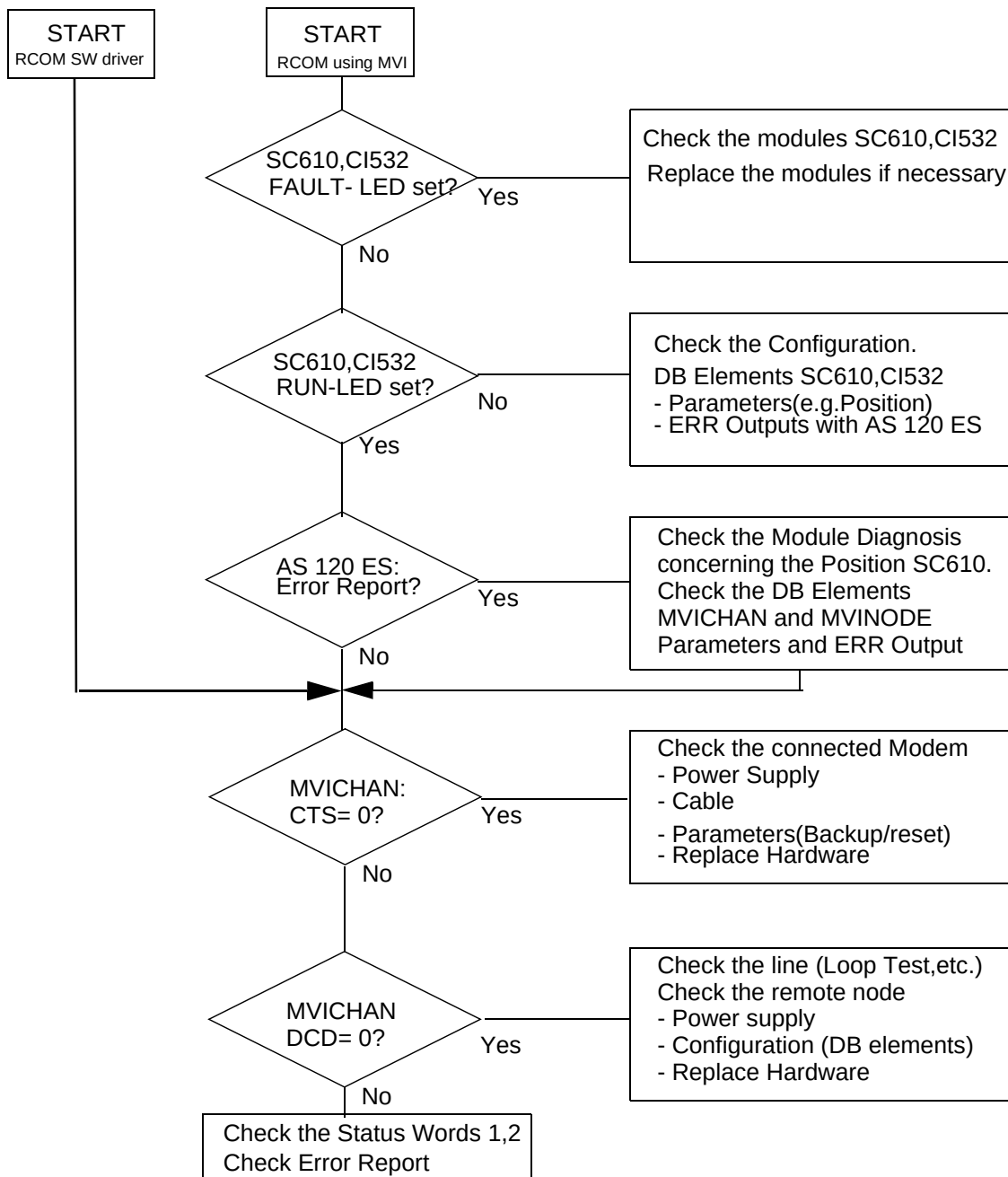


Figure 5-1. Fault-finding procedure for authorized user's including replacement of modules.

INDEX

A

AC 110 1-1 to 1-2, 1-13 to 1-14, 1-19 to 1-21, 2-2
AC 400 1-1 to 1-2, 1-12, 1-18
Advant Controller 110 1-1
Advant Controller 400 series 1-1

C

Cables 1-9
CCITT V.24 2-3, 2-6
CI532V01 1-13, 2-1 to 2-2, 2-4
Clock Synchronization 3-67
Cold Start a Slave 3-61
Command MVB 3-59
Configuration 3-1, 3-25, 3-29

D

Data MVB 3-52
DB Element CI532 3-26
DB Element MVB 3-47
DB Element MVICHAN 3-30
DB Element MVINODE 3-38
DB Element SC610 3-26
DB Elements 1-10, 1-15, 1-23, 3-13, 3-18, 3-25, 3-29
DSCA180A 1-11, 1-17

E

Engineering Tools 1-9
Event 1-28, 3-46

H

Hardware
 AC 110 1-8 to 1-9
 Cables 1-9
 Modems 1-9

M

MasterPiece 200/1 1-1
MasterPiece 40 1-1
Modem 1-9
MP 200/1 1-1, 1-11, 1-17
MP 40 1-2, 1-28, 3-81
Multi-drop 2-9
MVB for Commands 3-59
MVB for Data Transfer 3-52
MVI Status 3-40

N

Normalize a Slave 3-65

P

PC Program 1-10, 1-15, 1-23, 3-17, 3-20, 3-72
Point to point 2-9

R

RCOM 1-1, 1-25
RCOM Extended 1-27
RCOM Option System Software 1-2
RTU Status 3-40

S

Status1 3-41

T

Telephone Commands 3-68
Test tool 5-4

W

Warm Start a Slave 3-63



3BSE 003 181R0001 Rev A

January 1997